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INDUSTRIAL MEDICINE

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Industrial Health, Occupational Diseases and Traumatic Surgery

August, 1943

Medical Precautions and Treatments
— Associated with the Chemical Industry —

Wood Dust
— As a Cause of Bronchitis —

Women in Industry
— From the Standpoint of the Gynecologist —

Determining Margins of Safety
— Criteria for Defining a "Harmful" Exposure —

Toxic Products and Their Control
— A Plan for Use in an Industrial Plant —

Chlorinated Naphthalenes and Diphenyls
—Principles of Prevention —

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Prevention of Industrial Hazards
— A Study Based on 3600 Accidents —

Occupational Dermatoses
— As Seen by the Industrial Nurse —

Nursing Service
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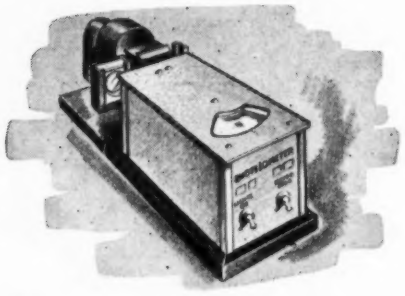

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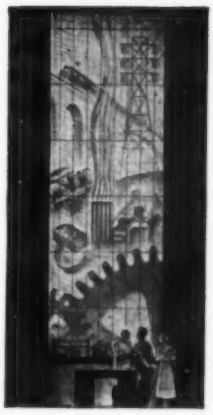

INDUSTRIAL HYGIENE
INDUSTRIAL MEDICINE
& RAILROAD SURGERY

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THE CHEMICAL industry is outstanding in its general and specific application of the rule stated by DR. NALE (page 505) that "a medical program should be designed principally as a preventive program." Typical of the extent to which the medical services in that industry "anticipate" emergencies and endeavor to forfend them is DR. NALE'S description of the "Medical Precautions and Treatments" characterizing his own department at Carbide and Carbon's South Charleston plant. . . . DR. MCNALLY and his associates (page 509) present the first experimental work with wood dust on animals that has been done. The scientific standing of the investigators and the circumstances of their 30 months' experiment sustain their conclusion "that similar long exposure may be injurious to some, if not all, human beings," and make their report a valuable beginning in the control and prevention of wood dust hazards. . . . DR. POMMERENKE (page 512), university background notwithstanding, discusses "Women in Industry from the Standpoint of the Gynecologist" with so little of the academic and so much of the practical as to make his presentation not only interesting but also immediately and directly useful. . . . DR. STERNER, in "Determining Margins of Safety" (page 514) crystallizes the criteria for defining permissible limits—in respect of which he concludes with the principle, universally recognized but not always followed, that "the only safe method for determining an atmospheric concentration is to make actual analyses at the *breathing zone* of the individual exposed." He carries forward the previously accepted standards, some of which, e.g., carbon tetrachloride, do not always conform to individual experience. As to carbon tetrachloride, the recent conflict of opinion is discussed in his editorial (page 532). . . . DR. DICK describes his plan regarding "Toxic Products and Their Control" (page 519). It is short, simple, and effective; and since its inauguration "there has not occurred

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a single case of serious intoxication from exposure to any toxic material," throughout his plant. This is the kind of prevention that prevents. . . . DR. GREENBURG (page 520), fresh from his Division's general restudy of the whole problem of "Chlorinated Naphthalenes and Diphenyls," as well as intimate experience with two recent outbreaks of toxic effects from their use, speaks with authority on measures necessary in control of the risks they involve. His faculty of combining instruction and interest are well illustrated here. . . . DR. BRINTON, DR. DREESSEN and MISS TRASKO submit an analysis of "Wartime Industrial Medical Services" of classic importance in the history and the statistics of industrial medicine. Twenty-five years hence, their presentation will be as interesting and valuable as a similar one made in 1918 would be now. Industrial medicine had an important part in World War I, but if it had not been for DR. SELBY'S studies, to which the present analysis refers, the record would be practically non-existent. The present analysis, however, has much more than historical importance. Aside from the fact that it is a statistical review most interestingly presented (which is rare), it has innumerable values which need to be read in order to be appreciated. The survey, which it so well details, was the basis also of the Advisory Group's recommendations as to the "Duties of Nurses in Industry" (page 565). . . . DRS. TOLAND and KORNBLUEH (page 534) present an exhaustive study of industrial hazards and their prevention. This, too, will reveal its values best from its own text. . . . FROM *Labour Management*, England, comes a description of "The Cray Valley Industrial Association" (page 558), a group scheme for employee medical service which is now operating satisfactorily in a small industrial area near London. Coming from the home of the Beveridge Plan, it may possibly convey a suggestion here . . . INDUSTRIAL NURSING is evolving its principles from the work of its pioneers. Hardly a rule or precept is decided upon as to which there are not many industrial nurses who can say: 'That's just what we've been doing for years" . . . TEN YEARS AGO (page 38) quoting DR. OTTO GEIER, from INDUSTRIAL MEDICINE for August, 1933, is a reminder also that the pioneers among industrial physicians and surgeons have likewise been "doing for years" the things now being recognized as the principles and practice of industrial medicine and surgery.

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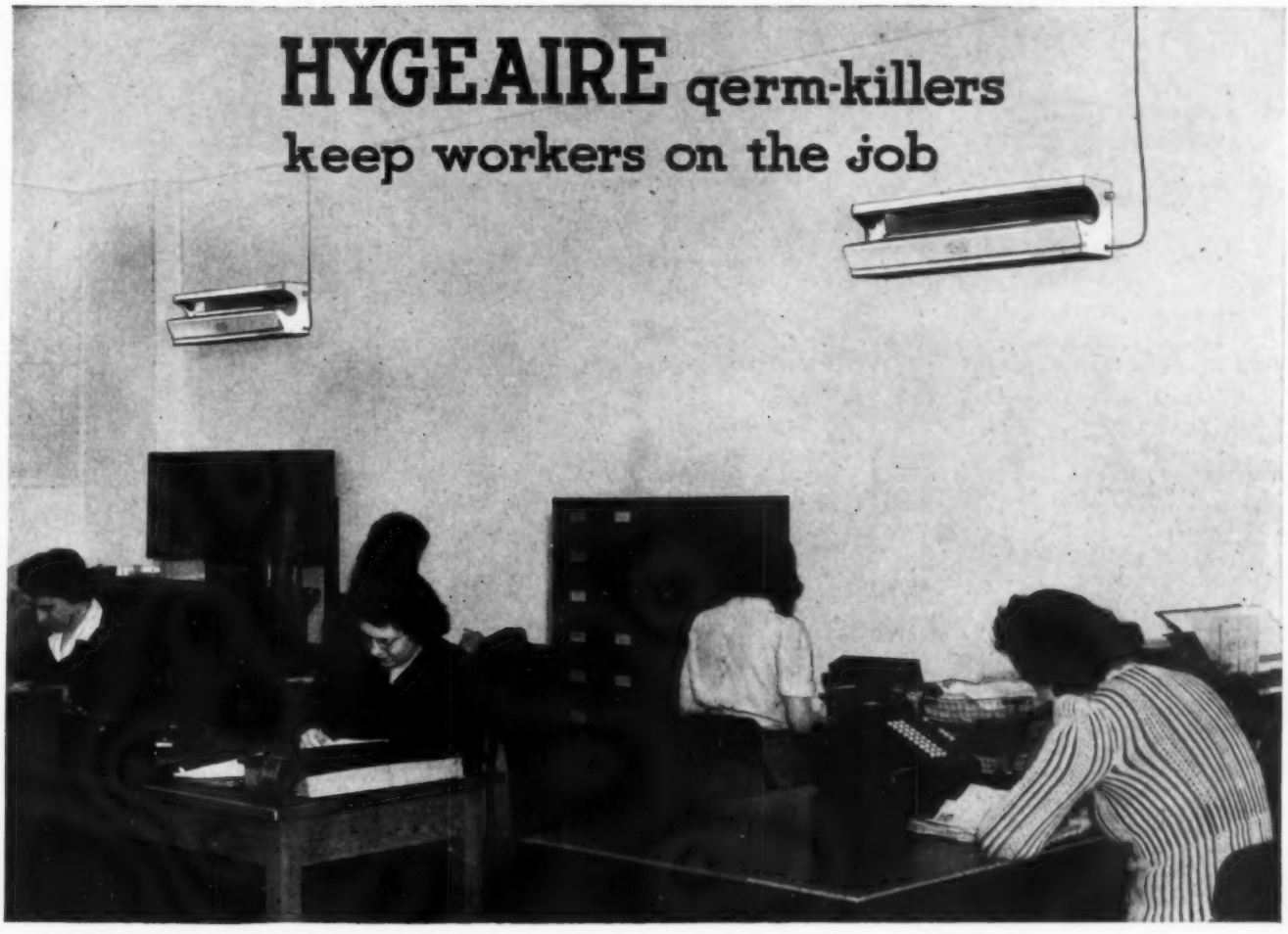

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THE University of Washington Alumni Association selects each year an outstanding living alumnus, distinguished for service over a period of years since graduation from the University of Washington, to receive the award entitled *Alumnus Summa Laude Dignatus*. At the University of Washington Commencement Exercises on June 12, 1943, this award was presented to DR. LOYAL A. SHOUDY, with the following citation: "The Alumni Association of the University of Washington in the year one thousand nine hundred and forty-three, considering LOYAL A. SHOUDY an outstanding graduate of the University, does hereby designate him *Alumnus Summa Laude Dignatus*. This recognition is accorded him, a native son of the State of Washington, for his eminence both as a practitioner and as a research man in the field of industrial medicine, and for his unfailing helpfulness toward his fellow men as well as his active loyalty to his Alma Mater."

DR. CHARLES SCOTT MCKINLEY, of Scotch Plains, New Jersey, has been appointed Director of the Bureau of Industrial Hygiene of West Virginia's State Health Department, to succeed DR. JOHN W. CROSSON, who resigned to become Industrial Consultant for Sharp & Dohme. DR. MCKINLEY'S appointment was made upon the recommendation of the U. S. Public Health Service. DR. HARRY M. BROWN, industrial physician at the DuPont plant, at Belle, West Virginia, is medical consultant for the Bureau.

MAJOR J. L. FETTERMAN, M.C., A.U.S, formerly assistant clinical professor of neurology at Western Reserve University School of Medicine, and now stationed at Lawson General Hospital, Atlanta, author of "The Mind of the Injured Man," just published by INDUSTRIAL MEDICINE BOOK COMPANY, was the principal speaker at the second institute on epilepsy recently held at Cleveland under the auspices of the Auracraft Shop of the Association for Crippled and Disabled.

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DR. JOSEPH LOPRESTI, Brooklyn (New York University College of Medicine, 1940) assistant surgeon, U. S. Public Health Service Reserve, has been assigned to the National Society for the Prevention of Blindness to carry on a program in the field of industrial eye hygiene, in cooperation with the medical profession and particularly with industrial physicians and industrial hygiene directors.

HENRIETTA LANDAU, Associate Public Health Nursing Consultant, States Relations Division, U. S. Public Health Service, analyzing the "Academic Qualifications of Registered Nurses as Revealed by the 1941 National Survey of Registered Nurses" (in *Public Health Reports*, 58:12, March 19, 1943) summarizes as follows: "About 5% of all active nurses were college graduates. Percentages for college graduates by type of position follow: Institutional, 5%; public health, 13%; industrial 1%; private duty, 1%; other, 4%." She heads her report "What's Past Is Prologue."

THE National Organization for Public Health Nursing announces the appointment of HEIDE HENRIKSEN, R.N., as industrial nursing consultant to succeed MRS. BETHEL McGRATH August 1. MISS HENRIKSEN is a graduate of the Presbyterian Hospital Training School for Nurses in Chicago and of the University of Minnesota, from which she holds a

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*References:

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Joiner, Hartwell: J. Georgia Med. Assn. 28:8:39
Read, Walter W.: Canadian M.A.J.: 41:493:39.
Strauss, C. W.: Industrial Med. 8:350:1939.

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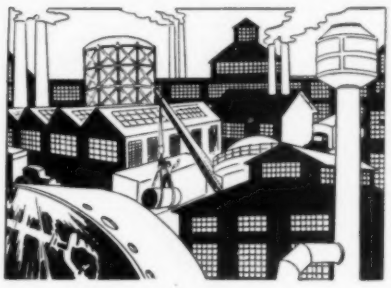
B.S. degree. She also has studied at Columbia University. For a time she was staff nurse with the Minneapolis Visiting Nurse Association, and since has been with the Twin City Lines of Minneapolis as industrial nurse. She is well known among workers in public health in Minnesota, having been president of the Minneapolis Unit of the Minnesota Organization for Public Health Nursing, and has given lectures in the public health course at the University of Minnesota and at local hospitals. She has also acted as vocational counsellor on industrial nursing in Minneapolis high schools, and has instructed many Red Cross courses in first aid and home nursing. MRS. MCGRATH will return to her former position with the Powers Dry Goods Company, Inc., in Minneapolis from which she was granted leave of absence for the period of her identification with N.O.P.H.N.

DR. HARRY B. MELLER research engineer, of Pittsburgh, died on June 27 at the age of 65. DR. MELLER, as chief of the air pollution investigation which has been conducted at Mellon Institute since 1923, was managing director of the Air Hygiene, now the Industrial Hygiene, Foundation.



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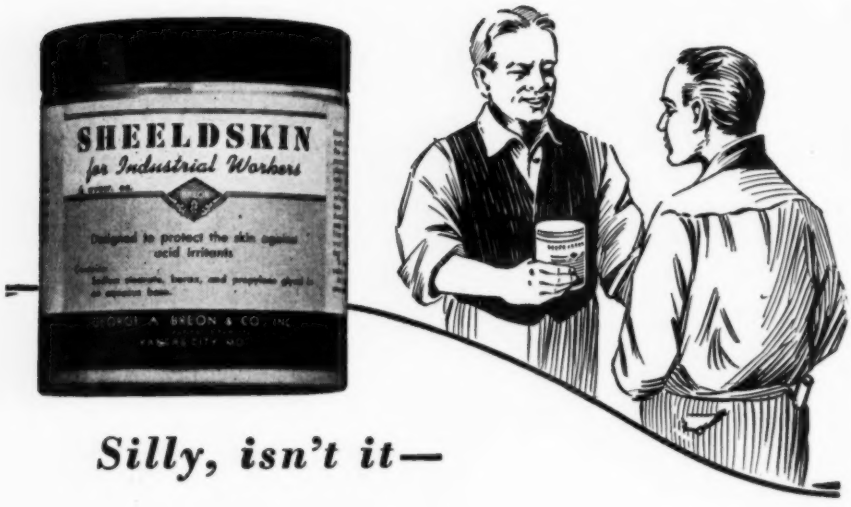

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Under running water; no added soap, the irritants and grime wash off, leaving the hands cleaner than they were before.

Because of application and removal, comfort in use, and, most important, *protection;*—machine workers* are looking for Sheeldskin.

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gency Base Hospitals and to assist the Army in extemporized hospitals in a serious military emergency. Members of these units receive inactive commissions in the U. S. Public Health Service and will be called to active duty by the Surgeon General only on the recommendation of the Chief Medical Officer of the Office of Civilian Defense.

THE Manpower Utilization Division of the War Manpower Commission of Region III (Stephen Girard Building, 21 S. 12th Street, Philadelphia, Pennsylvania) is developing a file of reference materials on subjects related to the utilization of manpower. This will include all subjects related to personnel work, and certain aspects of industrial engineering, management, health, transportation, safety, and similar topics.

JUST RECENTLY an arrangement was made between the Division of Industrial Hygiene and the Office of the Provost Marshal General whereby the state units can benefit from inspections of war plants made by officers of the latter agency. These officers will complete an additional form on potential health hazards in the plant and will submit this form with the request, if so indicated, that a further study of the plant be made by the state unit concerned.

—From "Activities of State and Local Industrial Hygiene Services in a War Year," by VICTORIA M. TRASKO, in *Public Health Reports*, 58:24, June 11, 1943.

AFTER indefinitely postponing the bill extending the area of occupational disease coverage, now limited to smelting, metal refining and battery manufactures, the Nebraska Legislature amended it and sent it on the way to passage. The bill strikes out specific coverages and inserts the following definition: "Occupational disease shall mean only a disease which is due to causes and conditions which are characteristic of and peculiar to a particular trade, occupation, process or employment and to exclude all ordinary diseases of life to which the general public is exposed."

—*New York Journal of Commerce*, May 26.

NEW HAMPSHIRE'S Division of Industrial Hygiene is presenting a series of broadcasts on industrial health problems.

PRIVATE industry in Mississippi is now employing 50 industrial nurses. Prior to July 1, 1942, there were only 18 nurses. Managers have recognized the value of a nurse in keeping down absenteeism. Part of a nurse's job is to interview people returning from absence. In this way she gathers important information about why a worker was away from work, and if, in the case of illness, he is well enough to return to work. This serves as a protection to the sick workers as well as to workers who are on the job, and might be exposed to a communicable disease.

—DR. WAYNE L. RITTER, Mississippi's Division of Industrial Hygiene, quoted in *Vicksburg, Mississippi, Post*, May 26.

Industrial Hygiene Manual

DR. FRANK T. MCCORMICK, in *Detroit Medical News*, July 5, reviews the new Manual of Industrial Hygiene and Medical Service in War Industries, recently prepared by the Division of Industrial Hygiene, National Institute of Health; edited by WILLIAM M. GAFAFER, D.SC.; published by Saunders (see INDUSTRIAL MEDICINE, May, 1943, p. 290). DR. MCCORMICK says: "Industrial activity, markedly increased by demands of war production, has presented new problems in the care of the worker. This manual has met the challenge in a terse and authoritative manner. It consists of a compilation by well-informed writers on a large group of subjects dealing with industrial hygiene. Among the topics discussed are organization of the plant medical department; medical, nursing, and dental services; organization for plant emergency medical service and integration with that of the community. Occupational diseases and dermatosis are given considerable space. Other chapters are directed to such important subjects as the control of respiratory and venereal diseases; fatigue; nutrition in industry; plant sanitation and absenteeism. Engineering problems concerning ventilation, air-conditioning and illumination are discussed at some length. This book admirably correlates all health agencies contributing to medicine and hygiene in industry. It is a valuable reference book for the industrial physician, nurse and safety personnel and, as the authors point out, should be especially instructive to those less

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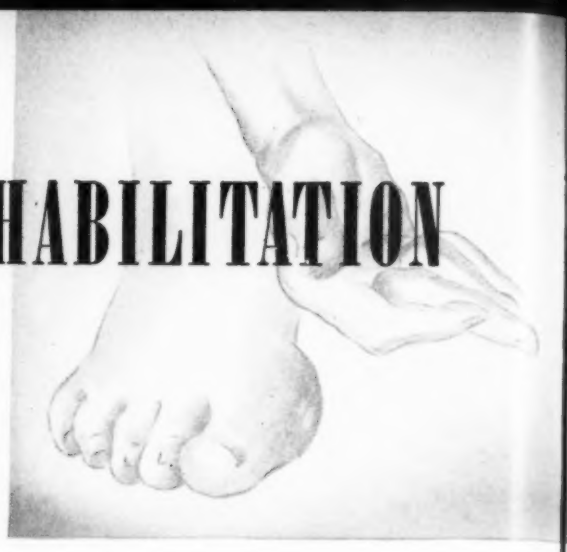

IN PLANNING an outline of treatment for the patient with chronic arthritis, the systemic nature of the disease should be given full consideration ★ *Ertronization* is a systemic therapy. The gradual, steady improvement obtained with ERTRON indicates its systemic action ★ It is generally agreed that analgesic medication may often be indicated during the course of *Ertronization*, and physical therapy measures may be employed to advantage. The removal of foci and the regulation of diet are also important. ★ In most of the investigations on the use of ERTRON in the treatment of chronic arthritis, no forms of therapy other than *Ertronization* were employed. This was done in order to demonstrate the true value of ERTRON in arthritis ★ However, in a well-planned program of rehabilitation based on *Ertronization*, a complete co-ordination of therapeutic measures is necessary for best and quickest results.

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SNYDER, R. G. AND SQUIRES, W. H.: A Preliminary Report on Activated Ergosterol, N. Y. St. Jl. Med., 40:708-719, (May 1), 1940.

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ITS specific antipruritic influence gives Calmitol a wide range of therapeutic applicability, especially during the summer months. More hours spent out-of-doors sharply increase the incidence of contact dermatitis, food rashes, summer prurigo, and intertrigo. When prescribed in these conditions, Calmitol instantly allays the torturing discomfort of the associated itching. It obviates the need for scratching, thus prevents traumatic lesions and actually hastens resolution of the original condition under treatment. Calmitol is also widely used in the treatment of urticaria, drug rashes, eczema, and pruritus ani and vulvae.

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experienced who have been called to care for defense workers during the war emergency. Demands on the plant physiican are becoming more and more perplexing. Such a book is a timely answer to many questions that may arise. In the wide field of industrial medicine, it is necessary that definite knowledge of plant health problems be readily available so that industrial efficiency be unhampered."

Occupational Diseases

FIFTEEN states reported that they made 215 investigations of 2,465 cases of occupational diseases in 191 plants which employed approximately 200,000 workers. However, only five of these states reported more than 100 cases each. Such investigations usually involve detailed study of particular operations and processes suspected of causing the disease, and medical examinations including laboratory tests of affected workers. It is difficult to ascertain the extent to which the speeded war production drive has increased the incidence of occupational diseases and injuries. General data are lacking, but from isolated reports it is known that an increase has occurred in the number of injuries occurring on the job as well as in the number of occupational diseases. For example, in one state the number of occupational diseases reported in the 1942 fiscal year increased 45% over the 1941 fiscal year. Moreover, most of the diseases which were investigated occurred in the strategic war industries, such as shipbuilding, aircraft, machinery, and iron and steel production. The most common types of occupational diseases investigated were conjunctivitis and dermatoses, accounting for 61% and 25% of the 2,465 cases respectively. Conjunctivitis cases occurred chiefly in shipbuilding industries among welders, burners, and workers in similar occupations. Kerato-conjunctivitis, which at one time assumed epidemic proportions in many states, was first investigated by one of the reporting states, and, after considerable study, attributed to possible non-occupational origin. Dermatoses occurred in practically all types of industries. The chief causative agents were given as cutting oils, chlorinated hydrocarbons, alkaline compounds, solvents, and food products. Ninety-seven cases of cotton fever were investigated in connection with mattress-making projects and textile industries using infected cotton. Among other cases investigated were: Lead poisoning, 69 cases; silicosis (diagnosis was not confirmed for all), 33 cases; anthrax, 39 cases, several of which were fatal; metal fume fever, 14 cases; mercury poisoning, seven cases; carbon monoxide poisoning from solvents, six cases; and respiratory infections, 28 cases. These cases are not necessarily an indication of the frequency with which they occur in industry. Nor do they represent all cases of occupational diseases reported to the central agency in those states with a compulsory reporting system. These cases represent only that portion of state's activities dealing with direct control of reported occupational diseases.

—From "Activities of State and Local Industrial Hygiene Services in a War Year," by VICTORIA M. TRASKO, in *Public Health Reports*, 58:24, June 11, 1943.

A.M.A.

THE Secretary reported an increase in membership of 2040 during the past year, in spite of the fact that a decrease had been predicted. In the last 10 years the membership has grown from 97,111 to its present figure of 122,741. This growth is believed to be proportionately larger than the increase in the number of physicians in the United States and seems to refute the rumor that the American Medical Association is losing prestige among the physicians of the country.

—From an editorial in *New England J. Med.*, July 1, 1943.

Health Survey

THE DIVISION of Industrial Hygiene of the state Department of Health through DR. MARY M. ATCHISON, acting state health officer, announced today completion of its first medical survey of the health of workers in industry. The project included health examinations for workers in the Brown company at Berlin. Successful carrying out of this large-scale effort was made possible by the whole-hearted cooperation of the Brown company management, the U. M. A. union and the workers themselves. The mass examination included dental examinations, blood tests, urine tests and chest x-rays. The New Hampshire Tuberculosis association, with the cooperation of DR. ROBERT KERR, executive secretary, aided in the mass chest x-ray examination and will provide resources for the important follow-up service. The program is

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Presenteeism

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PRESENTEEISM is the condition of being present. The higher the percentage of presenteeism in your plant, the greater the output produced.

This fall and winter, hundreds of industrial plants will build up presenteeism with ORAVAX, a small, white, enteric coated tablet containing a wide selection of recently isolated antigens. Designed to reduce the frequency, severity and duration of colds, it is particularly effective against secondary infections.

The method of administration is simplicity itself. The worker takes one tablet a day for the first week of treatment, then two tablets a week while the treatment continues. No needle—no psychological resistance—and ORAVAX is so economical that even the most extensive treatment costs less than one cent per day per man.

For full information on ORAVAX, write today for an illustrated booklet which gives every detail of the ORAVAX treatment, including results of extensive clinical tests. Last winter more than 400 industrial plants and other establishments protected employes with ORAVAX. In your plant, too, ORAVAX will build up presenteeism—keep the worker on the job—speed the output—and help in winning the war.

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A BUFFERED ISOTONIC COLLYRIUM IS IMPORTANT IN INDUSTRIAL HYGIENE

•

Solutions that would be entirely harmless to the skin surfaces may injure the eye severely, due to osmotic pressure changes within the membrane cells. Pure water or hypotonic solutions used in the eye favor development of edema or swelling, while solutions of a higher salt concentration than the tears may cause a shrinkage or loss of water from the membrane cells.

It is important, therefore, that any aqueous solution used for cleansing or washing the eye be very close to the same osmotic pressure lor be in isotonicity with the tears which normally bathe the eye. The osmotic pressure of the tears is normally much higher than that of the blood, corresponding to about 1.4% solution of salt.

Murine has been adjusted to this range of osmotic pressure.

Normally, the tears are slightly alkaline, having a pH of approximately 8.0. Marked changes from this hydrogen ion content may also cause irritation. Murine has therefore been buffered to this pH range.

Murine is indicated for regular use in industrial plants where strong light, dust, or metallic particles are prevalent. In cases of injury to the eyes, Murine is an effective first-aid preliminary to medical inspection and treatment.

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part of the nation's effort to protect the health of the industrial workers so necessary for the successful conclusion of the war. It is realized that an increase in a number of tuberculosis cases and deaths from the disease may result from war conditions. The industrial program was recommended by Gov. Robert O. Blood's committee on tuberculosis and carried out as a case-finding project. This program may soon be extended to workers in other manufacturing plants in the state.

—*Manchester Union*, July 3, 1943.

Dr. Wampler's Comment

Foremost in this group promoting industrial health have been the National Safety Council, the AMERICAN ASSOCIATION OF INDUSTRIAL PHYSICIANS AND SURGEONS and the AMERICAN INDUSTRIAL HYGIENE ASSOCIATION. These last two groups carried the banner for industrial health when many doubters and opposers stood on the side lines. The high standards of industrial medicine and hygiene were made possible by the character and professional strength of the men making up these two organizations.

—From the chapter "Notes on History," in "Principles and Practice of Industrial Medicine," edited by DR. FRED J. WAMPLER, published by WILLIAMS & WILKINS.

Glue Dermatitis

Dermatitis from glues has often been reported in the past, but there has been no such outbreak as that which is now occurring in the plywood and laminating industries. In one factory laminating plywood for planes and gliders (where about 800 workers are employed) 600 cases of glue dermatitis occurred in the first six months of operation. These workers lost about 1,500 work days, not counting the time lost by those who stayed on the job while receiving treatment in the factory first aid station. In a factory making tool handles from laminated glass fabric and phenol-formaldehyde molding resin, there was a monthly labor turnover, because of dermatitis of over 40 for the first six months of operation among a total of 100 employees. Twelve workers in a factory where paper is coated with a phenol-formaldehyde glue for use in making plywood were affected with dermatitis, and in another, where an alkaline casein glue was used for small wooden airplane parts, the fingers of most of the workers were inflamed and fissured by the glue.

—From "Dermatitis from Resin Glue in War Industries," by LOUIS SCHWARTZ and JOHN E. DUNN, in *Public Health Reports*, 58:24, June 11, 1943.

Physicians' Register

Long Island College of Medicine's department of administration announces the formation of a register of more than 150 physicians in the metropolitan New York area with experience in industrial medicine and surgery, interested in extending their practice among business concerns in the area. The register was established as a service to business concerns with health problems or in need of additional medical personnel. Information on file includes age, citizenship, military status, medical school attended, present hospital and industrial affiliations, nature of experience in industrial medicine and surgery, and amount of time available. The register is open for consultation by authorized representatives of business firms who make contact direct with candidates selected on the basis of the information on file. ALFRED R. CRAWFORD, assistant to the President of the College, explains that as a result of the post-graduate course in industrial medicine which the College conducted in November, 1942, for 34 physicians from six states, a number of industrial and other types of firms inquired as to whether the College could recommend medical personnel. The register was then established. The College takes no responsibility beyond making the information available to proper representatives. The file includes names of physicians in all the five boroughs of New York, and from Long Island, Westchester and New Jersey.

Wassermann Problems

Serological tests for syphilis should be and are included in all complete physical examinations. Doctors remaining in civilian practice who do a great many examinations for local defense industries are beset continually by problems in connection with routine blood tests. Foremost, is the problem of false positives. There is nothing so em-

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2. Essentially neutral and bland.
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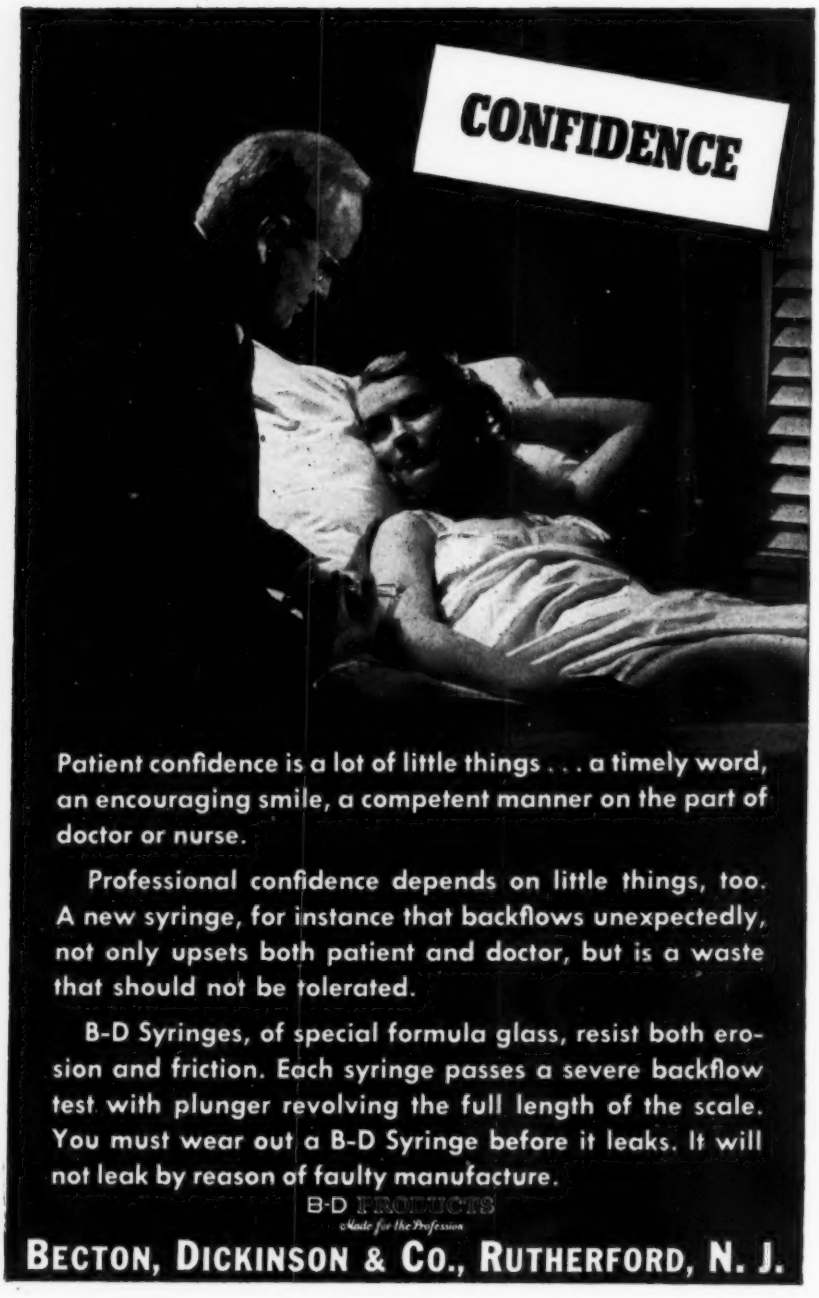
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Patient confidence is a lot of little things . . . a timely word, an encouraging smile, a competent manner on the part of doctor or nurse.
Professional confidence depends on little things, too. A new syringe, for instance that backflows unexpectedly, not only upsets both patient and doctor, but is a waste that should not be tolerated.
B-D Syringes, of special formula glass, resist both erosion and friction. Each syringe passes a severe backflow test with plunger revolving the full length of the scale. You must wear out a B-D Syringe before it leaks. It will not leak by reason of faulty manufacture.
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barrassing or time-consuming as the explanation of a false positive test turned up in the course of routine examinations. BENJAMIN S. KLINE, M.D., of Cleveland, wrote an article for the *Ohio State Medical Journal* for May, 1943, which is brief, clear, and pertinent. There is also an excellent article "The Interpretation of Serologic Reactions" by GEORGE V. KULCHAR, M.D., in *California & Western Medicine* for December, 1941. No doubt there are others which have not come to our attention. False positive reactions may be "technical" or "biologic." The former is due to error in technical performance and should be fairly easy to trace and exclude. The latter is also rare, but is usually due to some condition other than syphilis which, temporarily at least, provokes a positive response to some or all of the serological tests. Aside from yaws and leprosy, which we are little concerned with at the present time, malaria at some time in its course is very apt to produce positive serology. Mononucleosis is said to offend in as high as 20% of cases. Vaccinia was reported as the cause of 16% positive reactions in a group of 263 persons tested before and after primary vaccination. Scarlet fever, Rocky Mountain spotted fever, subacute bacterial endocarditis, lymphopathia venereum, are only a few of the many diseases which occasionally give rise to false positive reactions. To these must be added hyperproteinemia with increased serum globulin from any cause as a possible source of serological confusion. Suggestions for following up the indeterminant reactions have been made by Moore, Eagle, and Mohr, and are briefly stated: First, by means of questioning, physical examination, blood smears, heterophile titer, and sedimentation rate, a search is made to disclose recent or intercurrent infections. Then, a complete serological study is instituted, examining the spinal fluid where indicated. Positive tests with increasing titer usually mean early syphilis, whereas those which are less positive and have decreasing titers probably do not. Preemployment examinees occasionally remark that they have already had several blood tests within the month, and the question arises if we are not wasting time and material when the tests are made at the same laboratory. Inquiry at the Minnesota State Board of Health Laboratories indicates that it is less costly to repeat the tests than to check and clear the names of the thousands of negative reactors. In the positive or questionable cases, the record is always checked for previous serologic tests. To use a Hibernianism, the "doubtful positive" is one of those rare conditions we run into every day. There is, however, an orderly procedure which, followed, dispels the doubt.

—From an editorial by L.M.D., in *Journal-Lancet*, July, 1943.

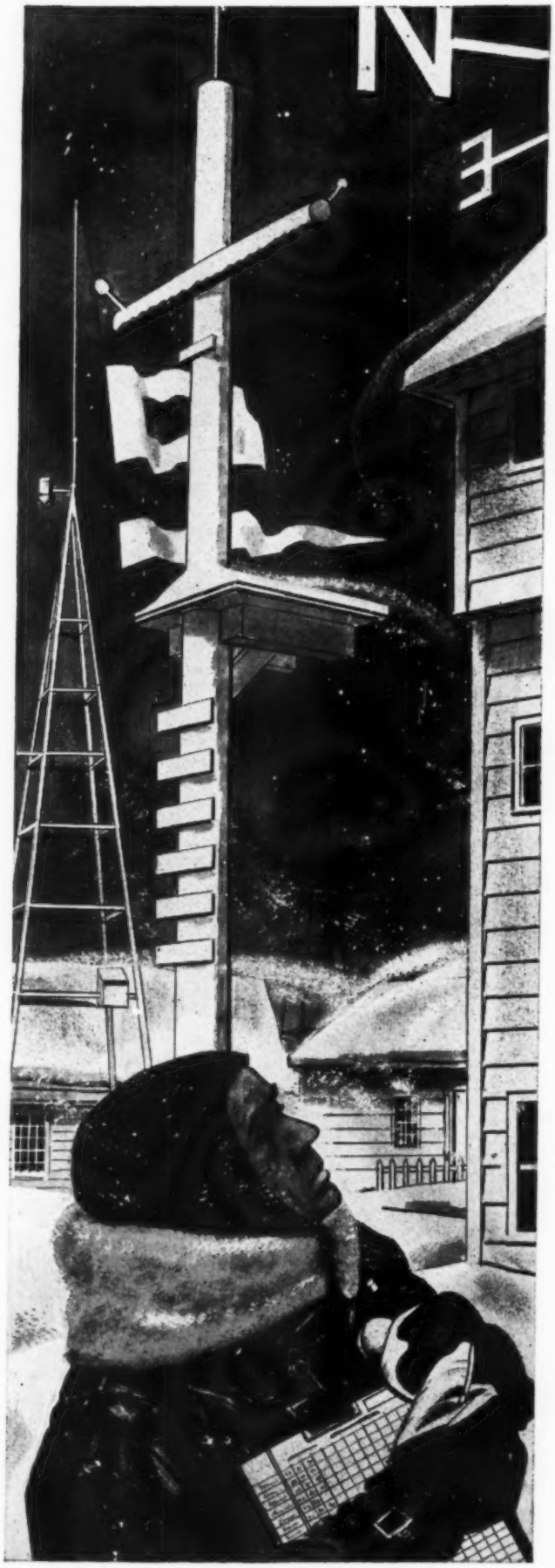
Delaware Amendment

BE IT ENACTED by the Senate and House of Representatives of the State of Delaware in General Assembly met: Section 1. That 6078, Section 8 of Chapter 175 of the Revised Code of Delaware 1935, as amended by Section 6 of Chapter 269 of Volume 43, Laws of Delaware (1941) be amended by adding thereto a new sub-section to be known as Sub-Section (f) as follows: (f) Any employee may apply in writing to the Industrial Accident Board for permission to employ a physician or surgeon other than the physician or surgeon furnished by his or her employer. Such application shall state the name and address of the physician or surgeon whose services are desired by the employee. Upon the approval by the Industrial Accident Board of any such application, the employee by whom or on whose behalf the application was filed shall be entitled to receive from his or her employer the reasonable cost of the services of any physician or surgeon whose employment was approved, performed subsequent to such approval, within the limitations provided for in sub-section (b) of this section. Approved April 16, 1943.

—*Delaware State M. J.*, June, 1943.

Global Data

A RECENTLY developed branch of the Army's astonishing health service is the Medical Intelligence Division, headed by Lt. Col. Tom F. Whayne. Here are collected, sorted, collated, indexed, and disseminated a remarkably varied and unusual assortment of facts related to the prevention and treatment of diseases and of disasters not inflicted by men. Here one may learn about poisonous sea snakes in the Persian Gulf; clams as large as wash tubs in the South Pacific; the behavior of scorpions in North Africa; the prevalent diseases almost anywhere; the varieties and feeding habits of mos-



WATCHMAN,

WHAT OF THE WINTER?

• In temperate zones, laymen and meteorologists alike know that winter brings foul weather and a tremendous increase in colds and similar disorders of the upper respiratory tract.

Moreover, if last year's record[1] may be regarded as characteristic, the weekly incidence of colds this winter will rise from a July minimum of about 6,500,000 to around 21,000,000 in mid-February!

As the number of colds increases, working efficiency declines. It has been estimated that one-half of all work-time lost in war industries as a result of illness is lost because of the common cold. Thus, during a single four-week period in midwinter, colds accounted for the loss of approximately 1,600,000 man-days of work in war industries alone.

Fortunately, the incidence and severity of colds may be considerably reduced by oral administration of antigens derived from bacteria believed responsible for the severity of the symptoms and duration of the disease. *'Vacagen' Oral Cold Vaccine Tablets* are exceptionally effective. Each provides the water-soluble, antigenic derivatives of approximately 60,000 million organisms of ten different types associated with infections of the upper respiratory tract:

Pneumococcus* (*Diplococcus pneumoniae*)	**25,000 million**
Streptococcus**	**15,000 million**
Influenza bacillus (*Hemophilus influenzae*)	**5,000 million**
M. catarrhalis (*Neisseria catarrhalis*)	**5,000 million**
Friedlander bacillus (*Klebsiella pneumoniae*)	**5,000 million**
Staphylococcus (*aureus*)	**5,000 million**

***Types 1, 2 and 3**
****Hemolytic, non-hemolytic and viridans**

The fresh antigens, extracted from *living* bacteria, are rapidly frozen, dehydrated under high vacuum, and made into *enteric-coated* tablets for oral administration.

'Vacagen' Oral Cold Vaccine Tablets are supplied in bottles of 20, 100, 500 and 1,000. Sharp & Dohme, Philadelphia, Pa.

'VACAGEN'
ORAL COLD VACCINE

1. Gallup, G.: American Institute of Public Opinion Survey, February, 1943

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10% SULFATHIAZOLE OINTMENT (HART)
A valuable aid in controlling pyogenic infection in wounds and minor surgery. Useful as an adjunct to the usual surgical procedures in: Contaminated and Acutely Infected Superficial Wounds and Burns; Boils and Carbuncles; Varicose, Diabetic and Decubitus Ulcers.
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A greaseless cream which dries rapidly and forms an adherent, slightly astringent film. For the treatment of Impetigo and Other Superficial Skin Infections of Coccal Origin.
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Stimulates epithelization and promotes healing with minimum scar formation. Valuable in the treatment of Burns, Wounds, Abrasions and Varicose Diabetic and Decubitus Ulcers. An excellent means of applying U.S.P. Cod Liver Oil without its unpleasant features.
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quitoes in any tropical locality; and so on almost indefinitely. Medical officers ordered to one of the many out-of-the-way places where our troops are now serving will do well to obtain information from this source regarding the local health conditions. A letter addressed to Medical Intelligence Division, War Department, Washington, D. C., and explaining why the writer is entitled to such service, should reach its destination—though we do not guarantee it, lacking complete and authoritative information.

—*Clinical Medicine*, July.

Roving Doctors

RUBBER tappers in remote malaria infested jungles of Central America are being cared for by a new type of roving doctor, the practicant. The practicant usually is a young medical student with sufficient practical knowledge to treat the rubber tappers for malaria, wounds and insect bites and similar ailments common to forest workers. One practicant working in the departments of Peten and Quiche saw 99 tappers and their families in a month's travel of 300 miles by boat and mule. In this group 26 men were found with malaria. Practicants are being assigned to this work in various parts of Central America where the Institute of Inter-American Affairs is cooperating with local authorities in the organization of health services for workers.

—*J. A. M. A.*, July 17, 1943.

"Eye Hazard?"

MANY girls have asked CONSUMERS' GUIDE whether leg make-up is dangerous. The answer is "No." It's a money and materials saving cosmetic, and a blessing in hot weather. The cream and emulsion types are better for covering blemishes than the coal tar dye types. Much of the irritation presumably caused by leg make-up has been traced to the hair-removing method used before the color was applied. Shaving is least likely to cause irritation. Incidentally, personnel managers have said they have no objections to it, provided it is applied skillfully, and provided the girl has something to apply it to.

—Consumers' Guide *News Letter*, July.

COMMENT and OPINION

WAR production has made necessary more than twice the number of industrial nurses guarding health on the home front, compared with the number of experienced nurses employed only two years ago, according to the Office of War Information. Today more than 12,000 experienced industrial nurses are employed in the nation's war plants, compared with 5,500 two years ago. "No mere finger wrappers are the young women who staff factory clinics. They know their plants, the types of work and machinery concerned. They are cognizant of and able to cope with health hazards involved in the manufacture of the weapons we are turning on the Axis."

—RALF GALL in *Chicago Daily News*, July 19.

DYSPEPSIA, indigestion, hyperacidity, and peptic ulcer syndrome have been on the increase in recent years. With the stress of the times, we can anticipate an upsurge in this general trend. Not only has this been noted in civil practice, but in military medical and surgical practice as well. Less than a half century ago peptic ulcer occurred more frequently in the female; in recent times less than 10% occur in the female.

—From "Symptomatology of Perforated Stomach Lesions," by L. E. HANISCH, M.D., in *Nebraska State M. J.*, July.

OF GREATEST significance has been the tremendous development that has occurred in the field of industrial medicine. Obviously the prevention of industrial disease is far more important than the treatment of either disease or disability occurring in industry. The growth of industrial medicine as a specialty has gradually drawn into that service many hundreds of additional physicians. Obviously the decision may yet have to be made as to whether or not the provision of medical services to the employee and his family is to be considered primarily a function of the industry, of the local community, of the state, or of the national government. Certainly it is already apparent that the grouping of human beings in health as a means of securing advance provision for the meeting of the hazards of illness is a permanent factor in our civilization.

—DR. MORRIS FISHBEIN, in "Current Trends in Medical Service," editorial in *Hygeia*, April, quoted in St. Louis Medical Society's *Weekly Bulletin*, June 25.

THE LIST of subjects which may be included in a health education program in industry is unlimited. A complete program would include discussion of such common problems as fatigue, nutrition, sleep, mental hygiene, proper clothing, cleanliness, dental care, ventilation, sanitation of home and community, respiratory diseases, digestive disturbances, tuberculosis, venereal disease, exercise, recreation, home care of the sick, care of children, and many other topics which will be suggested by the workers. Any plan for selection of topics should be developed on the basis of meeting the special needs of the group. The suggestion box method may be used, in addition to having an organized representative committee on health to determine what workers want to know.

—From "Health Education for Industrial Workers," by ELNA I. PERKINS, in *Industry*, June.

THE medical profession has never been remiss in its obligation to the Armed Forces and to the civilian population when war clouds bedimmed the horizon. In the Revolutionary War 1400 doctors served with the colors. In the War of 1812 the doctors were found side by side with their combatant brothers in arms. In the War of the Rebellion 12,000 doctors served with the Federal and 9,000 with the Confederate forces. In the Spanish-American War they were again equal to the occasion. When the Armistice was signed in November, 1918, 31,500 doctors were in uniform. Today between 42,000 and 43,000 doctors from civilian life are serving with the Armed Forces.

—From "President's Address," Jefferson County Medical Society, by IRWIN ABELL, M.D., in *Kentucky M. J.*, July, 1943.

A RECENT survey by the Curtis Publishing Company, showed that 62.8% of all vitamin users interviewed reported that their use of vitamins was at the suggestion of their doctor.

—*The New York Physician*, July, 1943.

UNCLE SAM is rolling up his sleeves to tackle the knotty problem of industrial absenteeism. A government campaign is being planned to reduce this tremendously expensive luxury, and labor and management are invited to cooperate in the drive. Government experts claim that absenteeism is due chiefly to the increased numbers of inexperienced help coming into war plants who lack good health and work habits.

—From "Health and Nutrition News Letter," Paper Cup & Container Institute, July 12.

THE more serious emergencies, such as starvation, exhaustion and morphine poisoning, which have a deleterious effect upon physical fitness, are unusual occurrences. The more common experiences of everyday life must be investigated to explain the predisposition of 80% of the population to an average of from two to three colds per year.

—From "Fitness, Food Allergy and Predisposition to Common Cold," by W. B. BROWN, M.D., and A. P. LOCKE, Ph.D., in *J. Missouri M. A.*; abs. in *Modern Medicine*, July.

THE indefinite status of most of the fundamental problems in the field of viruses is a reflection of the rapid growth of a new science. The field of viruses today would appear to be passing through a surge of development such as bacteriology went through in the two decades following 1880. The most promising feature of this development is the introduction of two new instruments for use in scientific study: the ultracentrifuge, whereby viruses can be purified; and the electron microscope, by which viruses can be photographed. The knowledge being developed in the field of viruses must bring many new procedures and materials for the control of infectious disease.

—From "Fundamental Aspects of Virus Diseases," by ROBERT G. GREEN, M.D., in *Minnesota Med.*, July.

How to help keep MEN AT WORK!

FEEDING great numbers of workers in a short space of time puts a strain on even the best of housekeeping intentions. When the rush is on, adequate health protective measures may break down. Serving in individual Dixie paper cups and containers can do a lot to prevent that danger . . . prevent possible contamination from improper sanitizing. The cleanup for the next shift is reduced to a few minutes.

★Another Danger Point to Watch

Much sick-absenteeism is caused by colds, sore throat, "flu" and other easily communicable diseases. Just as important as proper protection in feeding is freedom from contamination at the drinking water source. Mouth contact with anything that has touched the lips of others can be dangerous. Dixie and Vortex paper cups check contagion at this source.

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Duration of Disability

DR. WILLIAM M. GAFAFER'S "Duration of Disability from the Nonrespiratory-Nondigestive Diseases among Male Employees, with Particular Reference to the Older Worker" (in *Public Health Reports*, 58: 26, June 25, 1943) is the fourth of his studies on the duration of disabling sickness, based on absences lasting eight calendar days or longer. It presents principally an age comparison for males of certain pertinent indexes determined by specific nonrespiratory-nondigestive diseases. Four causes are analyzed. These, which were the principal time-losers among males 50 years of age and over, are diseases of the heart and arteries, the rheumatic diseases, diseases of the nervous system, and cancer, all sites. The frequency of eight-day or longer absences on account of diseases of the heart and arteries among this older group of males was approximately 6.5 times the corresponding frequency for men under 50, the number of days lost per man from this cause being 8.5 times that for the younger group.

Industrial Health Committee

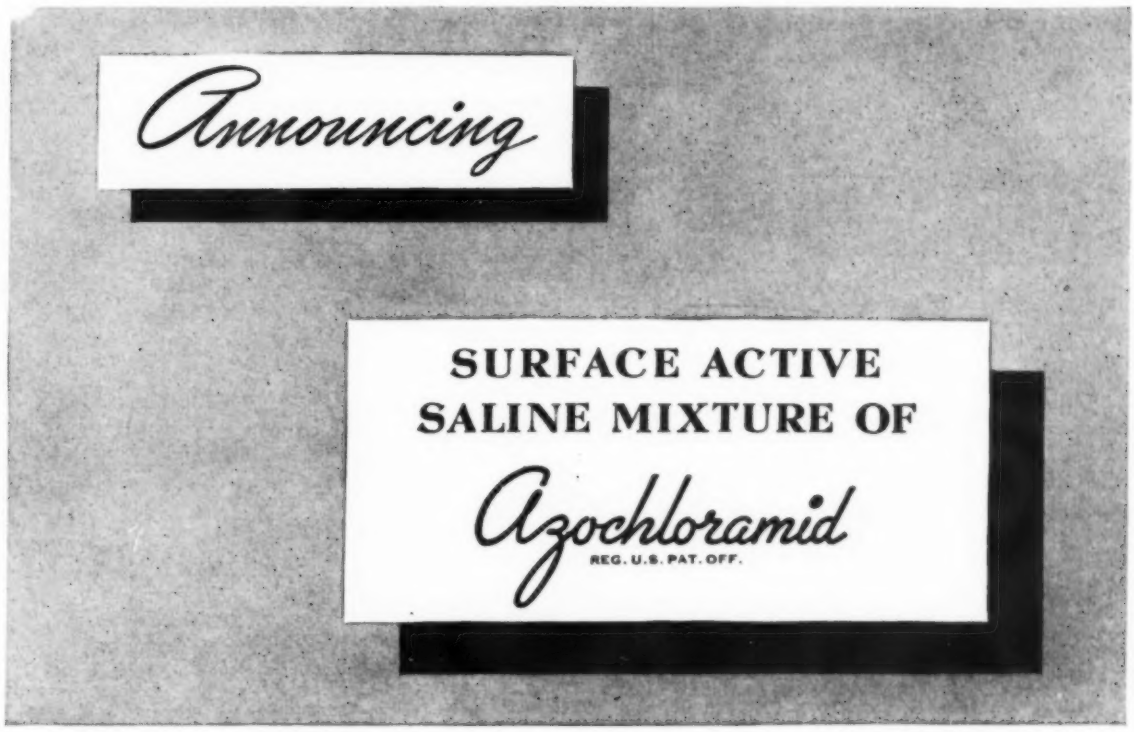
AT THE last meeting of the Council the Committee on Industrial Health announced that it would hold another all-day meeting similar to that held at the Harvard Club last November. This was done, with an entirely new program, on April 24, 1943. One hundred and sixty registered, most of whom were present for the luncheon at noon, which was addressed by Dr. Alice Hamilton, and at which we were also honored by the presence of Dr. Robert H. Parry, health officer of Bristol, England, and by the presence of President Schadt. The committee has continued to keep in touch with the State Department of Labor and Industries and with the State Department of Public Health, and has made a few fresh contacts with representatives of the Associated Industries of Massachusetts. The committee has advised several employers concerning medical services and has been able to aid in the placing of a few physicians in industrial medical work. It has met with a representative of the Council on Industrial Health of the American Medical Association, has prepared papers for publication in both medical and industrial journals, has delivered a broadcast on industrial health in cooperation with the Committee on Public Health, and has endeavored to be as active as possible on all fronts during this period of unprecedented industrial output.

—DR. DWIGHT O'HARA'S report, Annual Meeting, Council of the Massachusetts Medical Society, May 24; from Proceedings in *New England M. J.*, July 8.

Open to Question

THE Planned Parenthood Federation of America, Inc., alleges that abortion, under the guise of "sick leaves," accounts for much of the absenteeism in Southern war plants employing women. In some factories it is alleged by the federation that as much as 90% of the absences are so caused. This is said to be because pregnancy may mean discharge. There are about 6,000,000 women in the nation's war plants. The federation estimates that in the nation at large there are from 8,000 to 10,000 deaths annually due to illegal operations and that "at least eight women are rendered sterile for every one who dies," and expects that these figures will be considerably increased by what is transpiring among the war plants' feminine employees. The U. S. Department of Labor found in one war plant employing 20,000 women that 18% of its women employees had been pregnant, of whom 2.5% had resorted to abortion. In the light of this survey the federation's estimate seems open to question. The federation makes the following suggestions: (1) Abandon the practice of dismissing expectant mothers as soon as pregnancy is reported. (2) Permit expectant mothers to work as long as their health permits under adequate medical supervision during the time on the job. (Women can work up to the eighth month of pregnancy without endangering health if the work is not too strenuous.) (3) Give assurance of re-employment after the baby is born and of the retention of seniority privileges. (4) Give medically supervised child-spacing information to those married women who wish to postpone pregnancy either because of poor health or inability to care for another child at the time. The last suggestion seems to throw doubt on the federation's sincerity in making the first three recommendations.

—Editorial, in *Medical Times*, July.



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Occupational Diseases

Two years ago, at the recommendation of the Governor, an interim committee of the legislature was appointed to investigate the advisability of the addition of other occupational diseases besides silicosis and asbestosis for compensation under the workmen's compensation law. This committee, after considerable study and consultation, prepared a bill so providing which was passed by the last legislature. The danger of injustice to the employer or employee in such a bill, if the determination of the relation of a disease causing disability or death to occupation were left to any one but medical men, was realized. Provision was therefore made that all cases which involve only the question of an occupational disease shall be decided by a medical board of three physicians. A panel of 10 physicians with at least five years of medical experience with industrial disease, and five x-ray specialists with the same period of professional experience is to be appointed by the Dean of the Medical School of the University, the Council of the State Medical Association, and the Governor. The petitioner and employer may each choose one name from the panel, and these two shall choose the third member. The decision of the committee of three physicians shall be final. The bill was well composed and seems to have provided against many possible abuses and should provide proper compensation for disability or death resulting from strictly occupational diseases. It should be effective if enough physicians and x-ray specialists are still available in view of the number away in service. It includes, among other provisions for compulsory autopsies in disputed cases, the strict limitation under occupational diseases to those "arising out of and in the course of employment peculiar to the occupation . . . and due to causes in excess of the ordinary hazards of employment." No compensation is provided for occupational disease unless it has been contracted within 12 months previous to the date of disablement except in silicosis or asbestosis, in which case the disease must have been contracted within three years of disablement. Also, only occupational diseases contracted since the law went into effect are compensable. Those suffering from silicosis or asbestosis must have been exposed to the dust five of the past 10 years and at least three years in the state to qualify. At hearings involving controversial medical questions, the petitioner and employer may each provide the testimony of one physician. If the applicant is refused, that is the end of the matter except that the usual appeal may be made. If, on the other hand, "such finding and conclusion are in favor of the petitioner or if no question other than that of occupational disease is presented by the pleadings, the commission . . . shall forthwith appoint a medical board of three doctors of medicine selected from a panel of 15 . . ." The new law also allows the employer to provide for examination of new employees and for yearly examination of employees in hazardous occupations, the expense to be shared by employer and employee. One of the most important provisions of the new law is that the commission keep records of employment and regularly inspect places of employment in which hazards of an occupational disease may exist. It shall also establish standards of working conditions after consulting with the Division of Industrial Diseases of the State Department of Health. The justice of compensation to workmen for accidents in the form of bodily injury has been recognized for some time. The term "accident" has been extended to provide compensation for disability or death due to diseases strictly resulting from occupation. While there may be room for some difference of opinion in individual cases, a committee of three medical men should be able to decide.

—Editorial, *Minnesota Med.*, July.

"Will We Be Bought?"

On JUNE 15th, a long letter arrived from a Syracuse physician now in Service in a far distant area. We are not at liberty to use the writer's name but feel that it is quite apropos to quote a few excerpts which indicate that our colleagues in the Army and Navy are still thinking of the dangers confronting the practice of medicine in this country. He says, in part, "I, for one, would like to see some concrete constructive work employed on the problem of keeping medical standards where they are today and not give in to the politicians and manufacturers, and

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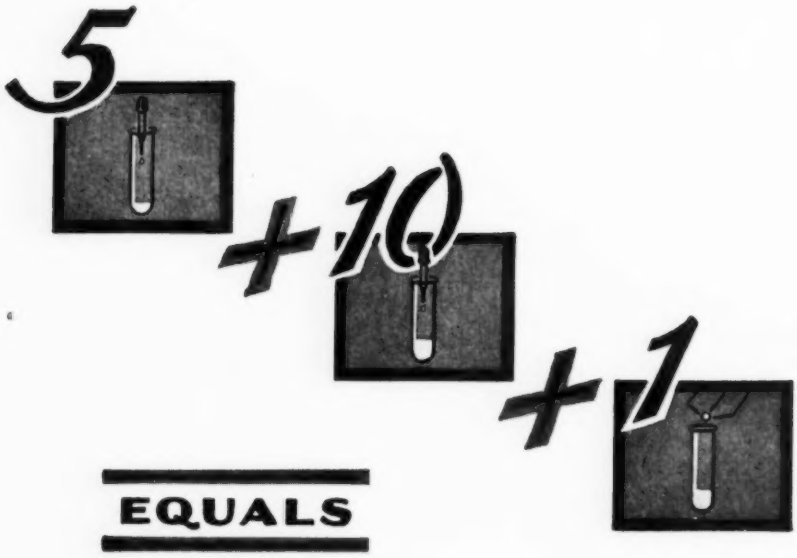

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the hospital superintendents, or, more properly, hospital managers. Not all hospital superintendents are in on the scheme, but the general trend is to knock down the high standards of medicine through the medium of knocking down the remuneration of certain jobs. For example: recently an x-ray man and I were discussing these problems whereupon he cited his own case . . . regarding the above trend. He has been out of an eastern medical school for 27 years and went on a hospital staff as part-time radiologist on a percentage basis, using his own equipment and maintaining a private office. The work increased in both places until his cut from the hospital end for one year (during the 1930's) was $16,000. He was called in by the manager of the hospital, informed that his department was the only one in the 'black' and that the rest were in the 'red.' The hospital managing board voted to limit his salary to $10,000 per year. He agreed, provided that the hospital bought the x-ray equipment at a depreciated value, which they did. He worked one year under that contract and was then informed that either he could work for $5,000 a year or get out as they had contacted another man who would take the position at that figure. This radiologist blames the unions as well as the industrialists for putting the medical profession on a lower basis each year because they (industrialists, et al) are trained to lessen the overhead if possible and because the medical profession is not well organized to combat that sort of thing. . . . I sincerely hope that others will think along similar lines and develop some constructive plan to combat this complete socialized plan which everyone is talking about and which the medical men have got to solve in some radical way to stave off complete subjugation to political parties, unions, and certain industrialists. The first problem is for the medicos to lay aside petty jealousies and animosities so as to pull together."

—Editorial, *Bulletin, Medical Society of the County of Kings*, July, 1943.

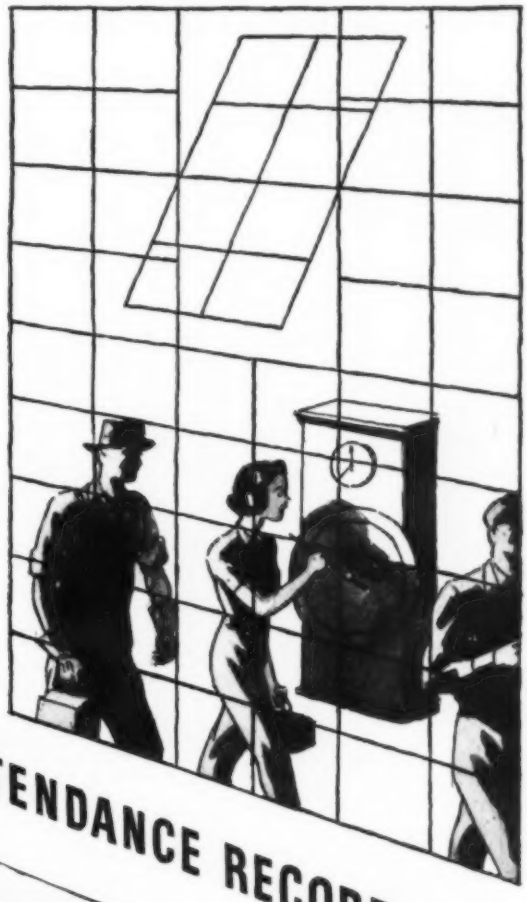
Westinghouse Picture

A MOTION picture entitled, "This Too Is Sabotage," which explains in detail how absenteeism is often caused by improper nutrition and shows how housewives serving health-building meals safeguard their family's physical fitness and cut down accidents due to fatigue, is now being loaned free for showings at war plants, schools, colleges, nutrition meetings, clubs and rural groups by the Westinghouse Electric & Manufacturing Company. The film shows easy ways to insure properly balanced diets in spite of wartime rationing and food limitations. The film, available in both 16 mm and 35 mm, lasts 25 minutes. Prints may be had by writing to the Westinghouse Visual Education Section, Mansfield, Ohio, giving choice of dates.

—*Printer's Ink*, July 2.

Doctor's Responsibility

FROM a governmental agency engaged seriously in the war effort with employees who work under the rules and regulations of the Civil Service Commission comes a complaint that some physicians do not take with sufficient seriousness their responsibility in controlling unnecessary absenteeism. One of the rules of the Civil Service Commission concerns the number of days and the pay allowed as sick leave. A request for over three days' sick leave must be accompanied by a certificate from a physician. Absence from duty is not permitted because of a slight illness which would not prevent the performance of duty or endanger the health of others. Nevertheless, many employees are absent for three or more days and seem to be able to prevail on some physicians to write certificates. If these physicians knew that certificates which cover certain slight illnesses would not necessarily be honored they probably would not bother to issue them. In one instance just checked by the government agency concerned, a physician in Philadelphia issued a certificate to the effect that a worker was sick with gastro-enteritis and was unable to work for a period of six days in the month of May, whereas investigation developed the fact that the person who submitted the certificate actually was working in another establishment on the dates stated and was attempting to obtain pay from two sources by requesting sick leave with pay from one of them. In the interest of the war effort and as a means of reducing inexcusable absences, physicians should refuse to issue certificates except in cases that can undoubtedly be considered to be of a serious nature and where there is no question



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but that the illness would incapacitate the person concerned for duty.

—"Current Comment," in *J. A. M. A.*, July 17.

Aluminum

ANIMALS have been in intimate contact with aluminum throughout the ages. It is found in all tissues. It is found in largest amounts in the livers of dogs and rats and in livers and brains of men. The absorption by the intestinal tract is exceedingly poor. When it is added to the diet in the amounts of 1400 parts per million, phosphorus absorption is inhibited. Under these conditions young animals develop severe rickets. Such a situation is never met with in normal diets or derived from aluminum utensils. We have no data at hand to show what effect the use of huge doses of aluminum as antiacid or intestinal adsorbent may have. Nor should we worry about its toxic effects because when injected parenternally, it produces no discernible effects. Growth is not retarded; reproduction and lactation are not impaired; and no changes are found upon autopsy in the tissues either macroscopic or microscopic. Some 35 years ago this country was in the throes of a sharp controversy over the alleged health hazards of aluminum. Fear had been created in the minds of the public through advertising of competing baking powder firms not containing aluminum that baking powders containing sodium aluminum sulphate as their acid constituent might be detrimental to health of the user. The Referee Board of Consulting Scientific experts consisting of some of the most famous physiologists and medical men of the time was created by President Theodore Roosevelt. These experts agreed that the aluminum itself exerted no deleterious effect beyond an occasional colic, and that aluminum compounds mixed with foodstuffs is not harmful in any way.

—From "The Role of Aluminum in Nutrition," Editorial summary by JONATHAN FORMAN, M.D., in *Ohio State M. J.*, July.

Medicine to Industry

WE SHOULD digress momentarily and consider the relationship of medicine to industry. Perhaps today, as never before, have the interrelationships between industry and medicine been so close and important. Almost all of the large industrial concerns have their own medical department with either full-time or part-time physicians. Most of them have a well-defined nursing staff with treatment rooms, first aid stations, and adequate materials, supplies, and equipment to carry on their work. Even the smaller industrial concerns have a modification of this program. On analysis, then, we see that four relationships are immediately involved; namely, (1) the workman or employee; (2) the employer; (3) the physician, and (4) the Industrial Commission. At first glance the task of handling all of the details of this relationship may appear simple, yet on scrupulous examination one can easily see the multiplicity of factors involved regarding medical care. This intricate system explains many misunderstandings of all parties concerned, and only close cooperation between the employee and his medical health program will help correct this deficiency.

—From "Prevention and Treatment of Infections of the Hand," by VINTON E. SIELER, M.D., in *J. Indiana State M. A.*, July.

Carcinogens

HERE this discussion of the nearer causes of cancer must come to a close. Those carcinogens which merely provoke the disease are crucial to it nevertheless, since without them it would not occur. Many are so powerful, the roentgen rays and certain synthetic hydrocarbons for example, that they bring tumors into being which under ordinary circumstances would never occur. They crash the gates of ordinary insusceptibility. Not a few agents to which man unwittingly exposes himself under the circumstances of ordinary life are scarcely less effective. A list of the human tumors which have been traced to the action of provocative carcinogens is in no small degree a sociological document, reflecting as it does the way of life, vocations, avocations, habits and environmental stresses of peoples and individuals. The occurrence of betel nut cancer in Siam, of kangri cancer in Kashmir, of mule spinners' cancer in England, and of osteosarcoma due to radium emanation in the United States demonstrates as clearly as the experimental findings in

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mice that every animal body possesses a myriad of potentialities for tumor formation and that only by good fortune do most human beings slip through life without the realization of a single one of them.

—From "Nearer Causes of Cancer," by PEYTON ROUS, M.D., in *J.A.M.A.*, June 26, 1943.

State Health Programs

THE WAR has brought into bold relief the paramount importance of industrial hygiene. In the development of a health program for each state, we recommend that careful consideration should be given to the following suggestions: The Industrial Hygiene Bureau should survey and evaluate industrial health hazards in all plants. Potential exposures to toxic materials should be analyzed quantitatively to determine actual risk to the health of workers. Engineering services should be extended to all plants having hazards in order to secure control. Physicians should be stimulated to report all occupational diseases in order that investigation of the working environment may be made and corrective measures taken. The bureau should sponsor more and better plant medical departments and augmented nursing service within industry. The bureau should make available, through cooperation with other agencies, undergraduate and postgraduate study of industrial medicine. It should work in the closest harmony and spirit of cooperation with the committees on industrial health of the national, state and county medical societies. It should study occupational disease incidence and medical absenteeism recording and reporting and be able to make recommendations to industrial management. The bureau should be available at all times for consultative service to private physicians on occupational diseases. It should sponsor industrial programs on nutrition, venereal disease, dental services and the rehabilitation of sick or injured workmen. Special plant studies should be made on sanitation, illumination, heat and humidity, noise, shock and other causes of fatigue and recommendations made to management. A continuous and never ending educational program should be inaugurated to labor, to management and to the public to correct bad health, preserve good health and maintain industrial production, happiness and good will.

—From "Report of the Committee on Health Programs," 41st Annual Convention, of U. S. Public Health Service with State and Territorial Health Officers, in *J.A.M.A.*, July 3.

The Future?

THE most serious threat to the American way of practicing medicine is the formation of plans, by some of those in government, for changes in the system of medical care. For many years certain groups in this country, following in the footsteps of similar groups in European countries, have labored early and late to fasten their socialistic program of state medicine upon the people of the United States. Surrounded and permeated by a motley group of intellectuals, sociologists, Ph.D's., citizen "fixits," and well-meaning but misguided people, the administration seems bent on the launching of an economic plan, an important part of which is the regulation of medical care according to plan, and the regimentation of the medical profession. We are not unmindful that changes in our economic scheme of life are bound to follow at the conclusion of this war. From the beginning, American medicine has kept pace with the development of the country, has worked out its own problems, has cleaned its own house, raised the standards of education and practice to a degree beyond that of any other country. Regardless of creed or color, rich and poor alike have received the best of medical care. Come what will, the men and women who have built American medicine through the last 100 years will not stop, but will continue to improve and progress under the free and competitive system of life.

—From President's Address, "California Medicine, in Brief Review," by WILLIAM R. MOLONY, SR., M.D., *California & West. Med.*, June.

Nerves

THE problem of a new occupational disease afflicting war plant personnel is engrossing the attention of doctors. Surveys describe the ailment as a neurosis with attendant physical disorders caused by prolonged strain. An outbreak among 14,000 men and women working at high speed on cotton textile contracts in Danville, Virginia, is reported as a typical instance. Within three hours on a recent hot afternoon 125 mill hands were stricken with abdominal pains sending them writhing to hospitals. Four hundred persons in all developed similar symptoms before the epidemic ended 10 days later. Stories of enemy spies drenching the factory humidifying system with poison gas, of saboteurs sprinkling odorous glass crystals on the

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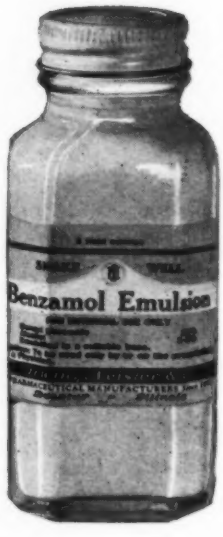

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floor and of other strange doings frightened many laborers into staying home. The result was a 15% decrease in production. Local authorities at first suspected spoiled food and impounded the pantries of nearby lunch-rooms, but examination unearthed nothing wrong with the stocks. The U. S. Public Health Service, Army Medical Corps, state specialists and even police detectives investigated the mystery. Physicians finally made the diagnosis that the reaction was owing to the loss of sodium chloride in the body, induced by excessive perspiration. Each patient was given an injection of a saline solution normally used for reviving persons weakened by post-operative shock. Thereafter recovery was swift. But the basic trouble in Danville was more than the dearth of salt in the human system. DR. HARRY HENDERSON, state epidemiologist, in consultation with colleagues, concluded that the mass collapse was traceable to tension and improper eating habits. He found that housewives employed on the looms had insufficient time for proper shopping and were compelled to serve whatever they could purchase quickly, instead of planning a balanced diet. Long hours, strain and fatigue aggravated the illness. The Virginia debacle merely illustrates a trend noticed by doctors elsewhere. Such psychiatrists even attribute the zoot suit and Detroit race riots to nervous explosions brought on by present living conditions. Only recently VICTOR G. HEISER, M.D., consultant to the National Association of Manufacturers, warned industrialists to provide menus and facilities for their men to prevent nutritional lacks. From his clinical studies he learned that food deficiencies are often responsible for mental depression, gastric upsets, easy exhaustion and retarded aptitudes. Hygienists also sound the alarm that the monotony of the conveyor belt type of work makes it imperative for firms and municipalities to maintain recreational activities and grant vacations. In the early months of the struggle such reliefs were unnecessary, but in this long-haul period a few breaks in routine are obligatory as health measures.

—*Columbus, Ohio, State Journal*, July 2, 1943.

War Worker's Lunch

THE typical "stenographers' lunch" of cake and "cola" seems to have been carried over to war workers in heavy industry. A recent survey of luncheon trays in four leading war plants in the Chicago area revealed that only 8% of the employees ate sanely. Twenty-one per cent made a choice of food close to the borderline of malnutrition, while 71% purchased totally inadequate meals. Lack of money was not the cause of the choice nor the lack of good foods, but rather a lack of appreciation of essential foods, for, instead of meat or cheese sandwich, doughnuts were ordered, instead of a salad sweets were the choice, and instead of milk the anemic food was washed down with soda pop.

—*West Virginia M. J.*, quoting *New York State J. Med.*

Syphilis Control

THE industrial physician is in a unique position in syphilis control programs because of his relationship with the worker, the plant officials and the private physicians and clinics. A syphilis control program that is well carried out cannot but help to bring these groups closer together. The private physician often looks at the industrial physician with fear that he will lure patients away from him. It is the duty of the plant physician to keep workers in good physical condition and, therefore, he must constantly be on the lookout for pathological conditions. The plant physician is not permitted to treat conditions that are not traceable to employees' occupation or to accidents, and he must, therefore, refer workers to their private physicians for the correction of defects. Very few of these cases would otherwise reach the family physician until symptoms interfere with their livelihood. In case of syphilis the plant physician acts as a case-finder for the private physician. He does not attempt to give treatment, but refers the case to the employee's private physician for treatment. When an employee is diagnosed as having syphilis, he is greatly in need of a

THIS IS OUR JOB --
"AS THE genius of man evolves new methods for his destruction so our profession must redouble its efforts to develop and perfect agents to cure, to relieve and repair."
— Bainbridge, W. S.: The Forward March of Physical Medicine, The Military Surgeon, 92:365-372, (April) 1943.

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friend who will give him proper advice and guidance. If the procedure is attempted by the private physician alone, the worker is likely to think, because the treatment is long and expensive, that he is not receiving proper service. The plant physician can and does advise the worker that the treatment of syphilis requires time and money, and that the private physician is doing the right thing. Too many patients lapse from treatment because they are not sufficiently informed as to what constitutes adequate treatment.

—DR. H. A. VONACHEN, in *J. Indiana State M. A.*, June, reprinted in *Ohio State M. J.*, July.

"Lousy Headache"

YESTERDAY Bill Smith was absent. When he reported to the personnel office this morning, he explained he'd had "a lousy headache." Ordinarily, that would list Bill as absent on account of illness. But Bill has a record of such absences, and his excuses run pretty much the same. In the Personnel Department he's put down as a chronic AWOL employee. Before we put a handful of Nazi money in Bill's next paycheck, or label him a production line "deserter," let's check up on what gives Bill that "lousy headache." In the first place, Bill is bored. He's normally a quick worker. He likes to have stuff move along. But at his bench there are frequent pauses while Bill waits for the next part to come to him. Also he's disdainful of the loudspeaker announcements urging full steam ahead on production. Isn't there a carload of finished parts just sitting on the loading dock? Hasn't that completed stuff been out there several days? Where do they get this hurry-up hooey? "And suppose I do take a day off once in a while. Who's going to miss me? I'm just one guy in several thousand!"

No wonder Bill had a headache. His morale has been beaten down by three things he doesn't understand; three things which only management can cure. Bill is suffering from poor placement, lack of proper induction to his job, and ignorance of production problems.

—From an article by RANDOLPH VAN NOSTRAND, in *Western Industry*, (San Francisco), June, 1943.

In German Captivity

ON ANOTHER occasion we were again told we could take a walk through the town. We flatly refused. Zina, Shura, Klava and several others, "ringleaders" of this action disrespectful to the German authorities, were led into the courtyard and given 15 blows each with a truncheon. Some of the women could not stand the terrible suffering. Nineteen-year-old Nina hanged herself, 21-year-old Olga cut her throat with a knife. I too began to think of ending my life, but a lucky accident saved me. My left hand was crushed at the plant. People mutilated in German captivity are no longer needed. I was sent back home.

—From *Information Bulletin, U.S.S.R.*, July 6, 1943.

TEN YEARS AGO

DR. OTTO P. GEIER, Cincinnati Milling Machine Company, in INDUSTRIAL MEDICINE, August, 1933: "A good industrial physician uses the occurrences of his dispensary to develop the far-seeing eye that suspects the source of skin diseases and infections. He investigates the cutting compounds and chemicals for possible causes. He traces possible hazards of dust, etc., when faced with bronchitis or tuberculosis. He is continually on the lookout for focal lesions as a basis for the recurring minor complaints, that rarely go to a family physician but which do appear at the dispensary—too often these reach treatment after disease has advanced beyond recovery. Such a department does not limit itself to the physical examinations made at the periodic health reviews. It uses a part or whole time dentist for prophylaxis and extractions, and encourages thereby the use of good dentistry on the outside. It is the business of an industrial physician to note the quality of medical service rendered the employee during illness by carefully reviewing the weekly reports of the family physician to the 'mutual aid,' to institute, as a function of the plant sickness fund, preventive measures against unnecessary prolongation of illness by the offering to the attending physician, at cost, of the 'mutual aid,' consultation, x-ray service, blood examinations. It pays an extra day's benefits if the outside physician is consulted on the first day of absence. The department should give the attending physician the benefit of the accumulated plant records of his patient; he should make re-examinations of the employee after absence from sickness."

Unprecedented times? Unprecedented problems

TODAY, more women are contributing to our national war effort than ever before. The unprecedented responsibility placed on them for full-time activity, intensifies many of their personal problems to an equally unprecedented degree . . . particularly that of menstrual hygiene.

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Ten years ago Tampax itself was unprecedented—since which time, well over five hundred million of these vaginal tampons have been purchased. Indeed, the only unprecedented thing about Tampax today, is the unusual enthusiasm evoked by the freedom it gives from the prospect of internal or external irritation . . . from all possibility of noticeable bulkiness . . . and from the exposure of the flux to odorous decomposition.

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[1] Spies, T. D.: *M. Clin. North America* 27:273, March 1943.
[2] Jolliffe, N., and Smith, James J.: *M. Clin. North America* 27:567, March 1943.
[3] Spies, T. D.: *J. A. M. A.* 122:497, June 19, 1943.

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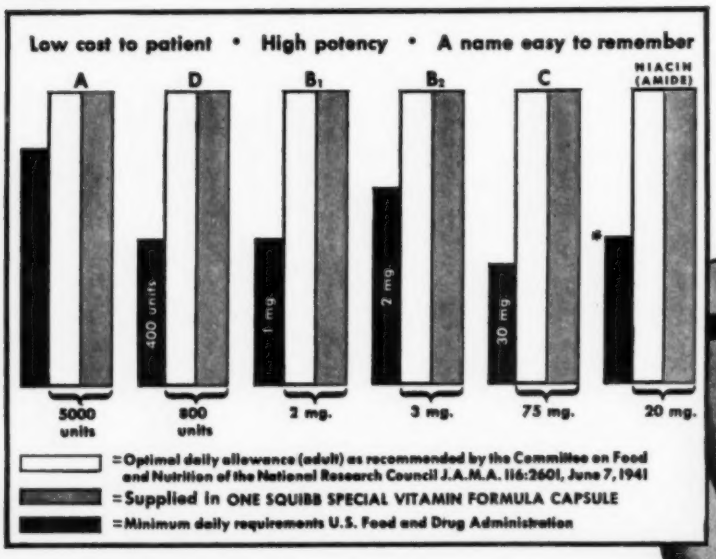
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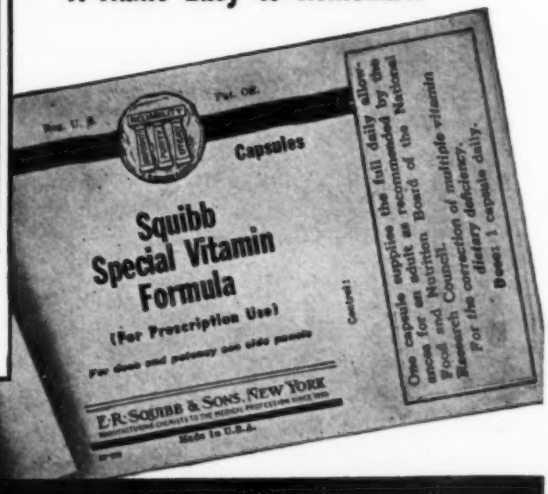

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The Journal of Industrial Health, Occupational Diseases and Traumatic Surgery

With which are consolidated "The Industrial Doctor" and "International Journal of Medicine and Surgery."

The Science, the Law and the Economics of Industrial Health

Volume 12 August, 1943 Number 8

Medical Precautions and Treatments

—Associated with the Chemical Industry—

THOMAS W. NALE, M.D.,
Medical Director, South Charleston Plant,
Carbide and Carbon Chemicals Corporation

IN THE time allotted it will be impossible to cover this subject in its entirety, but an endeavor will be made to discuss the more important phases of a medical program in the chemical industry. The medical program is essentially the same for any chemical industry, but certain specific precautions and treatments may vary with the type of chemicals being manufactured or handled. There is often a great deal of difference between the manufacturing of a chemical and the handling of the same chemical in its utilization. Any difficulty encountered in either processing or handling a chemical which is potentially toxic is dependent upon the contact of the chemical with the skin or the presence of the chemical in too great a concentration in the air breathed by the employee.

A medical program should be designed principally as a preventive program. Just as the practice of medicine has undergone a transformation from a practice largely curative to one which is largely preventive, so must a medical program for industry. The day has passed when an industrial medical service is one where the medical personnel sits around and waits for someone to get injured. They should be actively engaged in cooperating in preventing industrial accidents and illnesses, and in putting forth every effort to minimize absenteeism among employees. They should anticipate and be ready for any emergency treatment that arises.

The mention of a preventive medical program immediately suggests a program of health education not only for the worker himself, but also for his entire family. We must not forget that the average worker is on the job only 44 hours out of the 168 hours in each week. These hours away from the job may have a far greater influence on his ability to carry on efficiently at his work than his 44 hours on the job. A preventive program suggests education of the employee relative to the observance of proper safety precautions and the utilization of proper safety equipment, such as goggles, masks, protective clothing, etc. A preventive medical program not only suggests a safe, clean, well-lighted place to work, free from noxious fumes and dusts, but also proper provisions for adequate sanitary toilets, and washing and bathing facilities. This cannot all be done by the medical department alone, but means close cooperation and working with safety departments, process safety departments and management in general. It also suggests education of foremen and other administrative personnel regarding any particular hazard that might exist in the plant.

An important phase of this program of prevention is the physical examination of employees. The preemployment examination should be made with extra care, owing to the greater incidence of applicants with physical defects which accompanies a manpower shortage. The examination should be conducted in privacy and in a professional manner, as this is often the applicant's first introduction to the plant and has a lasting impression on him. A careful history should be taken of his illnesses, injuries and previous occupations. The examination process should include measurement of height and weight, recording of temperature and pulse, a careful check of vision, a blood test for syphilis, and a urinalysis. These procedures can all be done by nurse assistants. The examination by the examining physician should include a careful inspection of the eyes, ears, nose, mouth and throat. The condition of the heart, chest and blood pressure reading should be ascertained. The abdomen should be examined for abnormalities, and care should be exercised in determining the presence or absence of herniae or a weakness that might mean a potential hernia. The extremities are inspected for deformities and evidence of disease. Skin disease should be carefully looked for. This process represents the first medical precaution in the chemical industry as far as the individual employee is concerned.

The examining physician should have a knowledge of the various jobs in the plant and should understand working conditions. He should know when he examines a man what sort of job this man is being hired to do. With the present manpower shortage, a careful endeavor should be made to fit the man to the job so far as physical findings are concerned. For example, a man does not need as good a pair of eyes to dig a ditch as he does to watch the dials in a chemical unit.

As a general rule, the following physical conditions are not suitable for chemical plant operations: (1) asthma, (2) cases of advanced allergy, (3) a systolic blood pressure under 100 or over 160, (4) chest infec-

Presented at the Safety School of the Rubber Reserve Company held at Charleston, West Virginia, June 2 and 3, 1943.

tions, particularly tuberculosis, (5) certain heart defects, (6) advanced anemia, (7) kidney disease, (8) diabetes, (9) stomach conditions, such as ulcers, (10) visual defects that are not correctible with glasses, and (11) chronic infections of the eye.

Every new employee should have the benefit of proper safety instructions before he starts to work. This should include instructions as to the utilization of safety equipment and as to prompt reporting of all injuries to the medical department. These instructions are usually given by a member of the safety department.

Whenever time will permit, every employee should have the benefit of a re-examination, which should be a duplicate of the pre-employment examination, at least once a year. Employees working in specified environments that are hazardous should be examined more often—in some instances as often as every one to three months. For example, men exposed to benzene should have complete blood counts every six weeks. Employees who have been away from the job due to illness or injury for as long as a week should be examined by the plant physician before they return to work.

In these examinations every consideration should be given the individual being examined. This examination often causes quite a bit of nervous reaction to many individuals. The individual deserves to know about any defect found, and should be told about it and given recommendations for correction whenever possible. The examination process presents a golden opportunity for individual health education. It is gratifying to know how often individuals can be helped and their general condition improved by this endeavor.

The medical dispensaries should be equipped and ready to look after minor illnesses and injuries that are non-occupational. This service does much to enable ambulatory cases to remain on the job and to prevent lost time. Individuals running a temperature of 100° or more or suffering from more serious illnesses should be at home and under care of their family physician. The plant physician should be in readiness to offer advice and consultation service to employees relative to non-occupational illnesses. The medical dispensary should be prepared to administer special treatments, such as immunizations, etc., that can be given to help keep the employee on the job.

Occupational Injuries and Illnesses

ONE of the most frequent and troublesome classes of injuries encountered in a chemical plant is eye injuries. Despite every sort of precaution it seems that when dealing with chemicals someone manages by hook or crook to spill a chemical in his eyes. Every means should be employed to supply and encourage all employees to wear proper protective goggles—not just any goggles, but goggles designed for the job the individual is doing. The principal types used in the chemical industry are the vapor proof, chipping, standard protective, and, of course, special welding goggles. At the South Charleston plant employees who need corrective eye glasses are provided with goggles ground to their special prescription. The company pays for having the eyes refracted for these goggles. A supply of sterilized goggles is maintained at all times in the medical dispensaries and in the safety department. Every endeavor is made to prevent eye burns and other eye injuries, not only through individual eye protection, but also in maintaining safe equipment that will not rupture and spray chemicals about. Special eye washing fountains, which are foot-operated, are placed at strategic points in the unit so that in event a chemical reaches an eye it can be immediately washed out at the unit.

The immediate treatment of chemical burns of the eyes is by far the most important, so the dispensary should be prepared to give prompt medical first aid to eyes at all times. There should be maintained in each dispensary a list of chemicals used or handled in the plant. This list should be an alphabetical classification and each chemical designated as to the severity of the eye injury anticipated, and whether or not the chemical is acid, alkaline or neutral. Many of the chemicals in the list maintained in our dispensaries have been actually tested in rabbits' eyes.

When a case of chemical eye burn is brought into the dispensary, the attendant at once ascertains, if at all possible, the chemical involved. The eye is inspected and then anesthetized with 0.5% pontocaine solution. It is then irrigated with a continuous flow of normal saline solution without any pressure being exerted on the eye. (Normal saline is 0.85% salt solution made up with distilled water.) Special equipment consisting of a five-gallon bottle mounted on a movable stand and equipped to siphon the solution out is used. The patient is placed in a chair which can be tilted back so that he is in a reclining position. This continuous irrigation is continued for 15 minutes by the clock. The eye is then examined. Two drops of eye stain (2% fluorescein solution) are placed in the eye and the excessive stain is washed out. If the eye has suffered from a chemical burn, the damaged cells will retain the stain which is a greenish color. Three drops of 0.5% pontocain solution are dropped in the eye. The washing is then continued for 15 or more minutes by the clock. The eye is stained again, and if it still retains a stain the case is referred to an eye specialist.

You will note that no attempt whatsoever is made to neutralize a chemical in the eye. We feel that this should not be attempted. As a general rule, acids cause much less trouble than alkalies, and an acid burn is usually instantaneous without continued progression. Alkaline or caustic burns may continue to be active for hours and cause additional damage to the eye. For this reason, the eye specialist who sees the majority of our cases examines the cornea under a corneal microscope, by the utilization of a special technique, and, in alkaline burns particularly, removes the damaged cells from the cornea. During 1942, we experienced 663 chemical burns to the eye. Of the 663 cases, 85 were severe enough to require them to be referred to an eye specialist. In the utilization of the washing technique described, we have not had a case of lost or impaired vision due to a chemical burn in over 18 months.

It is possible to get rather severe burns to the eyes from fumes alone. In cases of chemical fume irritations, the same technique of emergency treatment should be used as for chemical burns. Certain chemicals may cause unusual reactions in the eye. Instead of producing immediate effects, the reaction may be delayed as much as four to 24 hours. Alkaloids and certain organic metallic compounds are notorious for acting in this way. The treatment is the same as for other chemical burns but they all should be seen by an eye specialist.

Foreign bodies in the eyes are frequently quite troublesome. All such cases should be taken care of in the dispensary. Every means should be exerted to discourage the practice of fellow workmen removing foreign bodies from the eyes. They should be removed with care by the utilization of sterile equipment and good illumination. Only one instrument should be utilized by nurses and attendants in removing foreign bodies from the eye, and this is a sterile, cotton-tipped applicator moistened in boric acid solution. The foreign body that is impacted so that it cannot be brushed off

gently with a cotton-tipped applicator should be seen by a physician or eye specialist for removal.

Hot bits of metal or scale in the eye should be removed in the same manner as ordinary foreign bodies, but all these eyes should be stained to ascertain the extent of damage done by the hot object. If there appears to be a burn to the cornea, the case should be seen by an eye specialist.

Penetrating foreign bodies or puncture wounds to the eye are the most troublesome of eye injuries as far as permanent disability is concerned. No attempt should be made at treatment in the dispensary except to apply a sterile eye pad and dressing, and the case should then be referred to an eye specialist at once.

Skin burns are frequently encountered in a chemical plant, owing to the fact that there is not only the opportunity for contact with thermal factors, but also chemicals capable of producing burns. Minor thermal burns are, as a rule, not accompanied by shock of any severity. The burned area is thoroughly cleansed and all particles of dirt and adherent material removed. Plain white soap and sterile water are satisfactory. The area is then sponged with hydrogen peroxide. If blisters are present, they are opened and the coverings removed, then a dressing of sulfadiazine or sulfanilamide cream is applied over the area.

In extensive thermal burns shock must always be expected and the patient must be treated for the same. Sterile sheets are maintained wherever a stretcher is stored. First aid trained workmen are instructed merely to wrap the patient in a sterile sheet, place him on a stretcher, cover him with blankets, and proceed at once to the medical dispensary. On arrival at the dispensary the clothing is removed and the patient is placed between sterile sheets. Hypodermics of morphine are administered to a sufficient degree to quiet the patient. Human blood plasma should be maintained for administration to cases with severe shock. No attempt is made to treat the burns locally except to spray their surface with powdered sulfanilimide and sulfathiazole. The final cleaning up of the burned surfaces and treatment is left until the patient is transferred to the hospital where this can be done in an operating room and anesthetics are available.

In contrast to thermal burns, efficient treatment so far as chemical burns are concerned can be accomplished at the plant. This early treatment can often prevent a severe burn. It is almost criminal to transport a patient some distance to a hospital without first endeavoring to neutralize these burns. This means large quantities of neutralizing solutions readily available, not only in the dispensaries, but also in the units. Safety showers should be present in every chemical unit where they are readily available. As soon as an individual has a chemical spilled over him he should be rushed at once to a safety shower and thoroughly washed with quantities of running water.

The patient is removed to the medical dispensary, where the clothing is removed and the areas are washed thoroughly with white soap and water. Preliminary cleansing should include scrupulous care in removing any solid particles from the scalp, eyebrows and other hairy areas. In neutralizing acid burns, 5% sodium bicarbonate solution is used, while in alkaline or caustic burns a 1% solution of acetic acid is used. Wet dressings soaked in the proper solution are applied and re-applied continuously for one and one-half to two hours. It is surprising how many of these burns which look severe at first will show marked improvement if the time and effort are taken to neutralize the chemicals. Of course, many of the organic chemicals are insoluble in water and have to be removed with solutions such as isopropanol. The after treatment of chemical burns is the same as that for thermal burns.

Before closing this discussion on burns, it might be worthwhile to mention some generalities. The fact that we hear so much about new cures for burns at once informs us that we do not possess an ideal treatment for burns. It must be remembered that a burn is an area on the body in which tissue has been killed, either by heat or a chemical agent. The body, in repairing this damage, must do two things, first, it must slough off the dead and damaged cells, and, then, it must replace them with new cells. In treating burns we can help by, first, aiding in removing the dead tissue, and, second, by preventing infection and keeping the wounds clean. The sulfonamide drugs help us a lot in the infections. The greatest advance in the treatment of burns is the treatment of the shock that accompanies severe burns by the early and liberal use of human blood plasma.

Skin conditions are not infrequently encountered in the chemical industry. Those irritations and skin conditions due to some chemical contact are classified as industrial dermatitis. The average employee about a chemical plant usually blames every type of skin irritation or skin disease which he might have as being due to some chemical with which he is in contact. Fortunately, many of these skin conditions are non-occupational. All cases of skin conditions should be seen by the plant physician; not infrequently they require the consultation of a skin specialist.

Much can be accomplished in the prevention of industrial dermatitis. One of the best ways to prevent these conditions is by having the workmen wear proper clothing. They should not only wear clean clothes, but also should thoroughly bathe and wash frequently. Workmen will often wear clothes saturated in a host of chemicals for days or weeks and, as a result, particularly in warm weather, will have a skin irritation. By proper clothing is meant clothing that affords proper protection. For example, an irritation to the legs can often be corrected by having the employee wear light-weight, full-length, cotton drawers. It may be necessary to wear the shirt sleeves down to the wrists or to wear arm protectors and aprons of some impervious material. A protective glove may also have to be worn.

The market is now flooded with protective creams and some of them seem to have merit. Many exorbitant claims are made for some of these preparations which are supposed to have curative values. I heard the physician who is the greatest authority on industrial dermatitis in this country make the remark that what he considered one of the greatest values derived from protective creams was that the employee had to wash thoroughly with soap and water to remove the cream. I have seen good results with the utilization of special protective creams where employees work in acid vapors and also in alkaline dusts such as lime.

In industrial dermatitis the areas usually attacked are the hands, wrists, neck, face, and legs above the sock line. In other words, the areas that get the greatest exposure are first attacked. Neglected industrial dermatitis may become generalized over most of the body. The early lesions usually appear first as reddened raised areas and later there is a formation of small water blisters. Some forms may develop into a pustular rash. In the treatment of the condition it is important to find out the causative agent, for when this can be found and the exposure is discontinued the dermatitis will clear up of itself.

In treating such conditions in the medical dispensary, the affected part should be thoroughly washed with white soap and water. A simple warm, wet dressing of Epsom salts solution is then applied for 15 or

20 minutes, followed by drying with a heat lamp for 10 minutes. A drying agent such as calamine lotion is usually utilized for further treatment. Advanced cases require more elaborate treatment.

When we think of industrial dermatitis we must naturally think of the condition known as allergy. Allergy is defined as a condition of unusual or exaggerated specific susceptibility to a substance which is harmless in similar amounts for the majority of the members of the same species.

An individual may acquire a sensitivity to most any foreign substance, so cases of acquired sensitivities crop up every now and then in the chemical industry. The symptoms may consist of only a skin condition, such as hives, or may become manifest as nasal pharyngeal congestions or even true asthmatic attacks. Some of the newer plastics, phenol compounds, maleic anhydrides, and "Carbic" anhydrides are powerful sensitizers. There is no treatment for the condition except the removal of the subject from exposure and it will then clear up. This sensitivity to chemicals is why individuals known to be allergic and asthmatic do not do well in a chemical plant or laboratory. Of course, where chemical compounds known to be powerful sensitizers are handled, every possible means should be exercised to prevent and minimize exposure.

A class of dreaded materials handled in chemical plants comprises chemicals with skin absorption hazards. It should be a hard and fast rule that whenever chemicals, irrespective of their types, are spilled on the clothes and/or shoes, these clothes and shoes should not be replaced, but the individual should put on clean, uncontaminated clothes and shoes. This service means that a supply of clothes should be maintained which is readily accessible to men working with such compounds. A partial list of such compounds is acrylonitrile, aniline, ethylene, chlorhydrin, ethylene imine, nitro benzene, organic metallic compounds of lead, arsenic, mercury, etc., oxygenated or organic chlorine compounds, propylene oxide, phenols and toluidine and other aromatic esters.

In plants where noxious gases are handled it is necessary to prevent and to treat cases of asphyxiation. In the field of prevention this means the careful maintenance of proper equipment that is free from leaks, and the rigid testing of tanks and areas before workmen go in for repairs. Gas masks should always be readily available. These masks should be of the proper type for the exposure anticipated. Fresh air mask equipment is well adapted for certain types of work. A good percentage of the employees should be trained in the proper administration of artificial respirations. There is one large portion of the South Charleston plant where every employee has had instruction, not only in the Schaffer method of artificial respiration, but also in the use of the portable H. & H. Inhalator. Facilities should be available for the administration of not only oxygen but also oxygen and carbon dioxide mixtures.

The dispensaries should be equipped with cylinders of oxygen to which is attached meter mask equipment for regulating dosages of oxygen. A very satisfactory mask is the O.E.M. mask. Portable equipment is essential as well as stationary equipment.

As an example of the practical use of oxygen as a therapeutic agent in a dispensary, we can use chlorine exposures. An employee is brought in coughing violently from the irritating effects of a chlorine fume exposure. An O.E.M. mask is fastened to his face and a concentration of 95% oxygen is started. This stops his coughing almost at once. The concentration of oxygen is continued for three or four minutes when the percentage is reduced to 80% and if the coughing begins over again, the percentage of oxygen is increased. This is continued with gradual reduction of oxygen until, usually in 15 or 20 minutes, the victim is free of his cough.

A book that can be highly recommended for those interested in this field is the 1943 edition of "Noxious Gases and Principles of Respiration Influencing Their Action," by Henderson and Haggard. Much of the contents of this volume is based on the work done at the Laboratory of Applied Physiology, Yale University.

In the chemical industry there can occur all sorts of traumatic conditions. The plant medical department should be prepared to look after any type of injury that might occur. This care should include not only general first aid, but medical first aid which goes much farther than first aid by non-professional persons. These injuries may include everything from simple lacerations to severe compound fractures and burns. In rendering medical first aid, it is imperative that the medical department be prepared to treat shock. No seriously injured man should be moved from the dispensary until efforts to treat and combat shock have been instituted. Every seriously injured man deserves enough morphine to render him quiet. The only true contra-indication is head injuries. These cases should not have morphine. In severe shock oxygen in high concentrations is very helpful. In the modern conception of shock it is not wise to keep these patients too warm, but efforts should be made to avoid chilling. Dried human blood plasma should be on hand to be given when needed. This can be obtained in limited quantities and keeps for at least five years without any refrigeration.

Every chemical plant that handles or manufactures materials that are liable to explode and/or cause fires should be prepared for a catastrophe. This requires much planning and organization of personnel in advance so that definite individuals and groups have assignments and know what to do when the time comes. There should be a definite organization for fighting fires, with mobile equipment on hand. This means that definite fire drills should be held periodically, as well as the training of rescue squads, first aid teams and the organization of medical and nursing personnel. The plans that have been organized by the Office of Civilian Defense can be coordinated with plans within the plant. The recommendations of this organization can frequently be adopted and modified to meet the demands of a chemical plant should a catastrophe occur.

Organization for Catastrophe

THE South Charleston plant covers an area of approximately 142 acres. It occupies a strip along the river bank and an island in the river. The island is 1¼ miles long and 900 feet wide at its widest point. There are two bridges between the island and the mainland. The fire station, in which is housed modern fire fighting equipment, is situated approximately in the center of the island. A qualified fireman is on duty at all times, and teams of fire fighters are at work at all hours. In the fire station there is a control station for a system of signaling and receiving messages. A system of signals is planned whereby the signal bells designate specified areas and the severity of the fire. Fire fighting equipment is also housed in the various units to take care of small local fires.

A crash truck, similar to trucks used at large airports, is maintained. This truck carries additional hose to supplement that carried by the regulation fire truck. Special fire fighting and rescue clothing, such as rubber hats, coats, boots, etc., is carried on the truck. Gas masks of all types, including self-contained oxygen masks, are stored in the truck. A portable H. & H.

Inhalator containing oxygen and carbogen is also on the truck. Special first aid equipment, such as stretchers, blankets, sterile sheets, bandages, dressings, tourniquets, extension splints for upper and lower extremities, is carried. A specially trained rescue squad accompanies this truck. These men have received special training by the U. S. Bureau of Mines and it is so arranged that a rescue squad is on duty at all hours. A total of 56 men have received this training.

There is a special group assigned to identifying and tagging all victims, as well as checking with the timekeepers to account for all workmen. Special record forms and tags are maintained for this purpose. One group is assigned to roping off areas and guarding the same. Another group has arrangements for supplying fire fighting and rescue squads with coffee and food. The plant protection force is organized to keep traffic lanes open for ambulances and emergency equipment. When individuals are away from the job and need to be called in for such an emergency, special arrangements are made for calling them in. Each man carries a special pass which admits him into the plant during the emergency.

The medical dispensary should be organized for such an emergency. Plans are made in regard to facilities offered by the various hospitals to look after casualties. We are organized so that one hospital will not be overloaded while others have none of the cases. The hospitals call in their own staffs. One of our hospitals maintains a large blood bank. There is also a blood plasma bank sponsored and maintained by the Office of Civilian Defense. We support and aid these banks. There are over 3,000 of our employees who have been blood typed, and each of these men carries a type card with him. A classified file as to blood types is maintained in the mainland dispensary. This provides us with a large amount of blood of known types ready for utilization. In our recent catastrophe with 10 men seriously injured or burned, some 89 units of blood plasma and blood were used. Carbide employees had replaced all that blood in the blood bank within a little over two weeks after the accident.

Provision is made to call in all the personnel of the medical department, and this can be done in a short while. Two dispensaries are open with an attendant in charge 24 hours a day, seven days a week. One of these is situated at the upper end of the island and the other at the lower end of the mainland area. A dispensary is located in the laboratory area but is kept open only during the day. There is a fully equipped dispensary at the upper end of the mainland area.

A casualty trunk is held in readiness. This trunk contains all the equipment recommended by the Office of Civilian Defense for a mobile casualty station, except for certain modifications necessary for a chemical plant. If an explosion or fire occurs in an area not adjacent to one of our dispensaries, this trunk is taken to the site of the disaster and an emergency casualty station is set up.

Outside the plant the Office of Civilian Defense takes over. Certain routes to the hospitals are kept open by state police, local officers and civilian members of the O.C.D. This all required special advance planning by the preparation of maps and details. We have found that by our cooperating in black-out drills we have profited a great deal. Members of the medical staff, personnel department, plant protection, safety department, process safety department, and fire fighters have been called out in these drills.

The planning for all these measures has been done by various groups in the plant and has been coordinated. We have these plans but always hope we will not have to use them.

Wood Dust

—As a Cause of Bronchitis—

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WOOD DUST in planing mills and woodworking plants has been considered a source of annoyance by the workmen and recognized as a fire hazard since a half century ago. Kober and Hayhurst[1] state that in woodworkers "the chief occupational risks are unfavorable hygienic environments, exposure to wood dust, sandpaper and sanding belts. The amount and character of dust depends upon the process in which it is evolved and the character of the wood; the dust from hard wood is finer, harder and doubtless more irritating to the respiratory passages." The senior author, who had lived in a Michigan lumber city, can recall the early use of sawdust separators, while in other dusty occupations workmen continued to be unprotected. Before the suction devices were introduced, men working on sanders and planers were covered with a fine wood dust and many of them frequently developed a bronchitis. They were unaware, however, that the conditions connected with their work had any relation to the cough which developed so insidiously. A chronic catarrh of the respiratory tract occurred more frequently in the planing mills than in those using the buzz saws in cuttings logs where the resulting dust was larger in size. The men thought the catarrh was the result of a cold. Even today men exposed to wood dust believe it to be harmless, and some foremen engaged in this type of work for many years claim that wood dust has been beneficial to their health. This same assumption with reference to other dusts has been met with in foundries where silicosis developed; the employers had formerly claimed that some of the employees who had been exposed continuously to dust for many years had gained in weight and never suffered with the usual symptoms of a respiratory disease. It has been observed, however, that in industries in which a fine dust was created, the change of workmen was frequent, that men employed with those allegedly immune, would become affected to such degree they would seek other employment or ask to be transferred to work such as gluing, trucking, etc., in the same department, but away from the dusty atmosphere. Some men working in factories making musical instruments seem to acquire a tolerance for dust and apparently are not easily affected. Air containing excess dust, however, is not a normal atmosphere for workmen to breathe, and such measures should be instituted as either to reduce the amount of dust to a minimum, or to confine it in such manner that it is not inhaled.

Several cases of tuberculosis were found in men who had been exposed to wood dust. In one of the factories manufacturing musical instruments, which employed 23 men, one workman claimed he developed the tuberculosis within a two-year interval though he had been employed as sander for 16 years. He was 58 years of age. On examination his family history was found essentially negative. The patient said he had had very little sickness in his youth while living in Rumania; had no operations nor diseases other than the tuberculosis; and no injuries except a splitting of the left index finger. He complained of shortness of breath, pain over chest and in back, and said he coughed up a considerable amount of phlegm. Physical examination revealed a very round-shouldered, stooped white

male who did not appear acutely ill. His weight was 108 pounds, height 55 inches. The hair was thin and slightly grey. Eyes reacted to light and accommodation; a pterygium was present. Ears and nose were negative. Teeth were in bad condition. Throat was slightly red, tonsils were present. Chest was emphysematous, shoulders very stooped. Heart was enlarged; there was a slight murmur. Blood pressure was 170/100, pulse 120-130. Abdomen was firm, no masses were palpable, there was no tenderness. Reflexes were physiologically normal. Blood count showed: Hemoglobin 82.9% (Newcomer); red blood cells 5,100,000; white blood cells 6,000. Wassermann test was negative. Roentgen study of the chest was as follows: This man has an extensive bilateral apical lesion which can be called pulmonary tuberculosis. There is much fibrosis; cavities are seen. The lesion is practically all in the upper half of the chest, extending a little lower on the right than the left. There are pleural adhesions at the right base. The diaphragm has a rather unusually low stand, such as one sees in emphysema. The heart is not too large. The mediastinal shadow is much too wide. The trachea is pushed somewhat to the right, although not much displaced. The contours of the aorta are hidden in the general mass of shadows in the upper chest. The ribs show advanced calcification of the cartilage. These findings are characteristic of pulmonary tuberculosis. Examination of sputum: Positive for tubercle bacilli; many tubercle bacilli present. An electrocardiogram shows that the alterations are indicative of myocardial damage. Right axis deviation is present.

The patient claimed that until the last three years of his employment there was inadequate ventilation in the factory. At the time this patient left his work I had occasion to examine the air in the plant and found the dust counts to be very low and the ventilation good. Four samples of air taken at various locations gave the results as shown in Table I.

TABLE I.

	Between two dust sanders	At sewing inlays	At horizontal belt sander	At twin-saw to the height of banjo
	There were 616,666 particles of dust per cu. ft. of air	There were 433,333 particles of dust per cu. ft. of air	There were 700,000 particles of dust per cu. ft. of air	There were 2,525,000 particles of dust per cu. ft. of air
Total solids	0.266 mg.	0.225 mg.	0.037 mg.	0.437 mg.
Organic matter	0.166 mg.	0.142 mg.	0.037 mg.	0.437 mg.
Hydrochloric acid soluble	0.041 mg.	0.083 mg.	None	None
Silicon dioxide	0.058 mg.	None	None	None

Although the dust counts were low in this inspection, the air may have been previously heavily laden with dust because of inadequate ventilation.

The so-called "sandpapers" are not entirely composed of silicon dioxide as is claimed in some textbooks, and those used in this factory varied in silica content from 0.30% to 9.57%. The papers used in sanding operations are made of garnet or aluminum oxide containing a small amount of silicon dioxide.

It has been generally conceded that wood dust is harmless so far as health is concerned. But the occurrence of tuberculosis in workers in wood dust occupations who had been previously in good health, leads one to believe that dust is a contributing factor. Sommerfeld[2] gives the mortality rate from tuberculosis among woodworkers as 6.6 per 1000. From a report by an insurance company of the causes of death in various occupations, it has been noted that of 2,538 deaths from all causes in employment involving the inhalation of fiber dust, 24.7%, or 627 deaths, were due to tuberculosis, whereas the normal percentage for the general population was 14.9%.[3] Table II, taken from Oliver's book on diseases of occupations, indicates the relative importance of dust to pulmonary tuberculosis:

TABLE II.

Occupation	Number of deaths due to tuberculosis per 1000 persons	Number of deaths due to tuberculosis per 1000 deaths
Occupation without production of dust	2.39	381.0
Trades giving rise to metallic dust	5.84	470.6
Trades giving rise to mineral dusts	4.42	403.4
Trades giving rise to dust from wood and paper	5.96	507.5

In considering the deleterious effect of dust we usually have in mind only the irritant factors and the transmission of infection by the dust particles. Certain types of dust, however, contain active principles such as oils, resins, glucosides, and alkaloids which may cause poisoning or allergic reactions. From communications with Drs. L. U. Gardner, C. P. McCord, L. Teleky, and the Mellon Institute, it has been found that no previous experimental work with wood dust upon animals had been done.

For years most investigators have written about and regarded as dangerous only those dusts which contained silica in some form, and considered dusts such as flour, cotton, wool, carbon and coal to be harmless. These latter dusts did not cause characteristic lesions in the lungs such as silicon particles do, but we have found that wood dust does produce an irritation. Smith[4] states that statistical evidence definitely places woodworking in a group of industries which, next to those obviously siliceous, show excessive mortality rates from pulmonary tuberculosis. This is illustrated in Table III, from Oliver's book on dangerous trades (1902):

TABLE III.

Occupation	Comparative Mortality Figure (All Causes)	Mortality Figure for Tuberculosis and Diseases of the Respiratory System	Ratio
Agriculturalist	602	221	100
Potter	1702	1001	453
Stone quarrier	1176	576	261
Cotton manufacturer	1141	540	244
Cooper and wood turner	1088	526	238
Mason	1001	476	215
Wool manufacturer	991	447	202
Baker	920	392	177

Oliver states, "These industries, although not remarkable for the production of other serious forms of illness, have this feature in common that, being essentially dust producing processes, they one and all induce among the workers excessive suffering from pulmonary affection. Although the mortality of these workers from phthisis and other lung diseases is considerably below that of metal workers, nevertheless it is in every case inordinately high, exceeding the mortality of agriculturalists by proportions varying from 77 to 120%."

The 75th annual report of the Registrar-General for England and Wales, covering figures for the years 1910-12, shows a comparative mortality rate for wood turners and coopers of 178 compared to 141 for all occupied and retired males and 70 for farm laborers. The same report shows that the percentage of actual over expected deaths at ages 25-65 was for:

	Per cent
Agricultural workers	59
Coachmen and grooms	79.2
Silk manufacturers	92.7
Stone masons in limestone	96.1
Wood turners and coopers	103.
Sandstone masons	182.

Comparing deaths from tuberculosis in various age groups among wood turners and the "standard population" this report shows the following:

						Total
Age groups	25	35	54	55	65	25-65
Wood turners	63	76	80	58	18	339
Standard population	47.7	50.7	48	33	..	180

The English figures for 1921 contained in the Registrar-General's Supplement show that in cabinet makers (who use sandpaper) there is a higher rate of tuberculosis and bronchitis. The mortality rate in respiratory disease for cabinet makers is higher as is shown in Table IV given for four different groups of workers.

TABLE IV.

	All Causes	Resp. Tbc.	Bronchitis	Pneumonia
Cabinet makers.....	93	117	121	51
Sawyers, wood turners and machinists.	34	81	64	28
Cotton spinners.....	137	102	131	121
Masons, stone cutters and dressers....	153	161	152	110

The mean annual death rates per 100,000 for respiratory tuberculosis by age for the woodworking groups compared with agricultural laborers and all occupied and retired males, as given in the same report, are shown below:

Age groups.....	16	20	25	35	45	55	65
Agricultural laborers..	39	106	106	76	80	70	61
Cabinet makers.....	64	139	169	205	221	137	103
Sawyers, wood turners and machinists.....	99	121	118	160	178	151	304
All occupied and retired males.....	69	136	133	160	166	150	114

In Melbourne, Australia, 208 woodworkers were examined and reported upon in 1929. It was found that 37% of all factory examinees presented departures from the normal in their nasal conditions, and it was considered that the percentage affected was considerably above the number that would be found in the civilian population. The causative agent in these cases was believed to have been the fine wood dust and siliceous particles inhaled. The report states, "Although not so apparent as would be expected persons engaged on machines fitted with efficient exhausts showed less nasal trouble than others working in factories where no exhaust system was installed."[4]

According to Smith,[4] Pincherle reports the examination of 20 woodworkers, 14 of whom showed pathological conditions of the respiratory tract, and of whom there were seven with bronchial catarrh, more or less intense, and seven with asthmatic attacks. The type of wood involved is not stated. The occurrence of asthma among woodworkers is chiefly from contact with the known irritant woods.

REVIEWING the material above quoted, it seems evident on the whole that exposure to conditions of work incidental to the trade of woodworking carries with it an increased risk from respiratory diseases, especially tuberculosis. Whether this has been due to the possible common presence of some siliceous material in the wood dust from sanding belts or some other source, or whether it is a secondary effect of general irritation of the respiratory system from wood dust alone, had prompted our investigation of the effects of pure sawdust without any possible added abrasive. Pincherle[5] cites Kurt Gade, of Rostock, who, examining wood dust under the microscope, found particles rich in sharp points capable of injuring the epithelium of the nose, trachea and bronchi.

Our investigation of 30 months duration was begun on May 22, 1939, with 10 rabbits. Only four of the original animals survived the entire experiment. As deaths occurred the animals were replaced. The first year a red cedar dust was used, and for the remaining 18 months a pine dust. The sawdust obtained from a mill was repeatedly screened through a 40-mesh screen before use. The animals were kept eight hours a day, five and one-half days a week in a chamber 8 x 8 x 8 feet in size which had a glass door for observation and openings for removal and replacement of the dust samples. When the sawdust was placed into circulation in the chamber some of the fine material was deposited on the side walls. The dust was kept in motion by an 18-inch electric fan, and replenished each day so that the dust count ranged from six to 10 million particles per cubic foot of air. The counts could not be made as easily as with siliceous dust because the wood dust particles would adhere to each other. After being filtered through a 300-mesh screen the dust still contained many hundred particles above 50 micra. Sixty-five per cent of the dust was 25 micra in size or over, 35% below that, and only a few particles below 10 micra. The smaller particles could not be counted because of their tendency to adhere to each other.

All of the pathological work was done by Dr. George J. Rukstinat. On June 20, 1939, the first two rabbits died. On section, the lungs showed a hemorrhagic bronchopneumonia and slight pulmonary edema. Sections of the spleen, kidney, liver and heart showed a passive hyperemia. The remaining eight animals and all subsequently replaced animals lost weight, but regained some of it when removed from the chamber away from the wood dust, for one and one-half days each week. The loss of weight was in all probability due to the fact that the animals were neither fed nor given water while in the dusting chamber. All of the animals which were alive at the end of the first year and at the termination of the experiment were x-rayed; nothing unusual was found in the films. On August 4, 1939, the third rabbit died. Sections of the lung showed a marked bronchopneumonia and bronchitis. The pneumonia involved at least 50% of each section and was in an early stage of hepatization. Between August 4 and September 1, 1939, four more rabbits died. Disseminated abscesses were found in the lungs, some near the bronchioles. Most of the abscesses contained granular or amorphous purple blotches in their centers. Rabbit No. 15, which had been first placed in the dusting chamber on April 22, 1940, died August 13, 1940. Sections of the lung showed an emphysema and a slight bronchopneumonia. There was hyperemia of other organs. Rabbit No. 16, first dusted on April 13, 1940, died September 9, 1940. The lungs showed a bronchopneumonia, partial atelectasis and a compensatory emphysema. Rabbit No. 20 died January 18, 1941. The lungs showed an early bronchopneumonia and other organs a passive hyperemia. In all the other animals including the three of the four original remaining, the organs were examined only grossly. Large abscesses were found in the lungs of three animals. In the fourth rabbit a suppurative pleurisy was found on the right side. All of these animals were markedly emaciated. At autopsy it was found that the nasal passages and upper respiratory tract of all animals contained sawdust.

CONCLUSION: In the review of the literature and from our experiment of 30 months duration of dusting animals with sawdust, which caused changes in the lungs from a bronchopneumonia to large ab-

scesses, we have come to the conclusion that wood dust in concentration of 10,000,000 particles per cubic foot of air, breathed for periods of eight hours a day, five and one-half days a week, in rabbits, is harmful, causing irritation of the respiratory tract, which predisposes to bronchitis, pneumonia and tuberculosis. The presumption is that similar long exposure may be injurious to some if not all human beings.

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Women in Industry

—From the Standpoint of the Gynecologist—

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THE industrialist of old was often accustomed to consider production only in terms of units and of foot-pounds. Manpower was generally available, and ideally suited, in the absence of modern machinery, to provide the labor. Laws and regulations as they applied to man-geared industry were man-made, and the inconsequentially few women employed had little opportunity to express their views or needs, either by initiative or referendum.

The shortage of labor which has developed as a result of war remains acute and will probably become more and more acute as the reservoirs are becoming depleted by the demands of the expanding armed forces and by the diversified industries which support the military activities. Owing to the needs of accelerated industry, the employer has been compelled to become less discriminating in his selection of workers. Unfortunately, the employment of women has still been subject to the mores of another age. But large scale employment of women has become an actuality. In this country alone some 12,000,000 women have been recently recruited by industry. And still the clamor for more workers continues. There remains a reserve of perhaps 5,000,000 potential workers among women. Many of these women are green in industry, and have undertaken employment in response to need, opportunity, or sense of duty. When trained they will represent a substantial investment, and will become invaluable to industry. They will however require varying degrees of specialized preparation.

This training costs money and results in decreased production. About 75% of the women in this reserve are housewives. They will continue, even when employed, to have domestic responsibilities which claim their physical and emotional constitutions. The problem of health of these women is their just claim, and is a natural concern to the employer who will be well rewarded for his foresight in attending to health matters of his workers on and off the job. And, to this end, all the resources of medical knowledge, curative and preventive, should be brought into operation.

In present-day mass employment, the woman shares with her male companion the ordinary industrial risks. Her sex, however, makes her more vulnerable to the stresses when working under forced pressure. Special problems come into play, and special consideration becomes her due. She has less stamina than man. She is, moreover, more susceptible to fatigue. Being a woman as well as a worker, she is frequently subject to monthly periods of tension. Often being a wife as well as a worker, she will from time to time have to face the problems of maternity.

The shortage of community physicians, and the mass migration of female workers to industrial centers often create the situation by which the industrial physician is perhaps the only physician the worker has consulted in years. This situation calls for sympathetic regard for the problems which are characteristically female in nature. Where and when possible the physician should be encouraged to take short refresher courses to enable him better to care for his women patients. A great deal of misinformation persists among the laity concerning the meaning and ramifications of sexual physiology. With a better understanding of the purpose and nature of menstruation, and its recognition as a physiological rather than as a pathological process, many a woman may be re-educated and come to regard the so-called difficult days as days in which she need not seriously curtail her usual activities. In gynecology, as in other branches of medicine, proper diagnosis is essential to proper treatment. To this end a careful physical examination is necessary. In the past there has often been a hesitancy about examining female workers, particularly with reference to their genital organs. While it is admittedly difficult to estimate the loss of time and the debility resulting from ailments of the genital tract, no specially gifted imagination is required to realize that this loss must be tremendous. There should be no serious objection if, in the course of the careful physical examination, it appears desirable to include the reproductive organs in this study. After all, the patient comes to the physician for advice and treatment, and who is better qualified than the physician to care for the patient, and to give her counsel relating to genital disorders, and the problems resulting from the sexual urge.

Dysmenorrhea

THIS term applies to local pain or discomfort which may accompany menstruation. Normal menstruation should transpire with little disability. While a large number of women experience little or no trouble at this time, it must be realized that this ailment disables many who at other times enjoy good health. Doubtless a great deal of dysmenorrhea has an organic basis. But just as certainly, many women owe their recurring periods of incapacity to faulty knowledge of physiology and to the taboos long associated with sex. In other words, dysmenorrhea is often a psychological disease. Treatment, however, must be based on the knowledge of the causative factor. This calls for the investigation of the physiological, physical, and psychological make-up of the individual. Getting the patient in the optimum general condition will do much in correcting this fault. In the absence of organic disease, proper explanation to the patient of the *naturalness* of the process of menstruation will do much to allay her fears. Simple sedatives—those free from dangers of addiction—are often helpful. An hour's rest at the critical time may save a day's work for employee and employer.

Pregnancy

WAR or no war, women will have babies, and should have as many as are eugenically advisable. If the woman wants a child, she should have a healthy one. However, other women should be provided with instruction and methods whereby pregnancy may be avoided. This is particularly true in those cases in which for health reasons—using a broad interpretation

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of the term 'health'—pregnancy should not be allowed to occur. Many potentially available women are suitable for industrial work and may carry on their usual activities as long as pregnancy is not superimposed. Many such women may enjoy life and be productive only if their health is not jeopardized by pregnancy.

In the years 1936-40 an estimated 750,000 deaths resulted from causes associated with pregnancy and childbirth. One can easily comprehend the magnitude of this wastage to society and to industry. No great argument is necessary to emphasize that this loss might have been appreciably reduced with proper instruction and pre-natal care. Absenteeism due to childbearing has come to be provided for in the well ordered planning of industries hiring many women. With proper care, this absenteeism may be appreciably reduced. However, absenteeism and damage to health resulting directly from unwanted or medically inadvisable pregnancy are decidedly unnecessary, and should be avoidable. There are many working expectant mothers who actually need to continue to work as long as it is possible and safe for them to do so. Both employer and employee profit by the continuity of work. To discharge the pregnant woman at the onset of pregnancy entails loss of service and investment. Money and time are required to effect replacements. It is certainly to the interest of the war activity that pregnant women be maintained in a suitable state of health so that their productivity may be protected for as long as possible. Many industries, in a far-sighted manner, are providing, through their medical departments, pre-natal care as a part of the general health program of their employees. The maternal health program should be complete in its broad aspects, and women should have access to maternity care from the beginning of pregnancy. In the end the woman will remain a more productive worker. While certain instances of maternal and fetal deaths must admittedly be classified as unpreventable from a practical standpoint, yet with proper pre-natal care, which involves no less than properly spaced medical check-ups, the toll from toxemia, hemorrhage, and infection may be immeasurably reduced. Personnel officers should, where possible, make a careful job analysis, and arrange for transfers of pregnant women to departments of greater safety if risks are involved. Pregnant women should not be subjected to heavy work or to overlong hours. Women should not be threatened with discharge merely because of pregnancy. If the woman feels assured that she will not lose her job she will be more apt to heed the physician's advice. Leaves should be granted in due time on the physician's certificate. Threat of discharge may lead the woman to conceal her condition. It may result in neglect of necessary pre-natal care. It may even drive the woman to an abortionist. Worry and strain will slow her down and sap her energies just as surely as will physical overwork. Absence from work two months before and two months after delivery should be an absolute minimum, and seniority privileges should not be jeopardized because of this enforced absenteeism.

The problem of maternal health is inseparably linked with the problem of planned parenthood. The purpose of planned parenthood is not necessarily to prevent maternity, but to allow the mother to recover adequately before undertaking another pregnancy. We should offer safe and practical means of avoiding pregnancy to women who are ill or in whom pregnancy would bring out latent serious disease. Who can even estimate the danger of stillbirth and abortion if an expected child is not wanted, or when the woman is physically or otherwise ill-prepared to undertake its care? Who can estimate the degree of emotional trauma and instability that results from the fear of an unwelcome or medically inadvised pregnancy? Industry pays dearly for the scourge of abortion. It has been estimated that there occur some 680,000 abortions a year in this country; a large percent of these involve married women. Only the medical profession is fully aware of the potential dangers of abortions. What we want is fewer and better abortions. Women should have the right to have children when they want them, man-made laws notwithstanding. The question is not whether women will seek contraceptive information—the question is rather from whom they will get it, neighbor, friend, drug-clerk, or physician. This question and its solution also relate to venereal disease.

The Middle Aged Woman

WITH the entrance of women of an older age group into industry, and the retention of others who, under less urgent circumstances, might have retired earlier, the problems relating to the menopause and degenerative diseases of the genital tract become more and more important. The menopause occurs while other bodily functions are frequently still in perfect running order. With the advent of hormone therapy many women may be eased over this troublesome period. One should, however, warn against injudicious and indiscriminate administration of various experimental preparations. The effects of long continued use of some of these pharmaceuticals are not known, and may be harmful.

The possibility of malignant disease of the generative organs constitutes a matter of great concern to all women, particularly in the post-menopausal age group. Here early recognition and appropriate treatment with radiation or surgery at present offer the most encouraging prognosis.

It might be briefly stated, in summary: The mass migration of women in industry has created new problems—problems that are essentially feminine in nature. To a large extent, the industrial physician and surgeon has replaced the family physician. It behooves him, therefore, in the interest of the patient and industry, to apply modern methods to the care of his charges. The patient, moreover, should be encouraged to report symptoms suggestive of possible serious illness. Periodic examinations of women with due regard to the gynecological symptoms and findings, along with an educational program, must find their place in the health program of industry.

Abstract of Discussion

DR. POMMERENKE: I would like to mention the menopause. There is a general notion, due to articles that have appeared in lay magazines, that no women need suffer from symptoms of menopause. I think if we can explain what is occurring, many women will look ahead, realizing that life begins at 40. They are freed from many discomforts, fatigue and allied debilitating factors, if they realize what they are going through is perfectly normal.

I would like also to mention something about the placement of pelvic organs with reference to the so-called position of the uterus. It is rather impromptu that I state this.

Women are subjected to surgery far less nowadays than formerly because of retroflexion of the uterus. I recall 15 years ago it was a common operation, and all the old books had many illustrations and chapters on operations for suspension of the uterus. I believe we must realize the uterus is not a fixed structure. If the individual lies or stands there is a good deal of variation in the position of the uterus. Many have retroflexed uteri and no symptoms at all. Fifteen years ago, a woman with a retroflexed uterus was told it was indication for an operation. Many have anterior uteri or uteri in mid-position that have more symptoms than women with uteri in the posterior position. It is only fair to give such women a trial by pessary.

Let me emphasize, in concluding this very informal discussion, that I think education of women, education of adults, more than any other therapeutic agent will add to the efficiency and help do away with many of the ailments that are functional in character and oftentimes cause women to lose time and have so-called subjective symptoms.

CHAIRMAN WATSON: The gynecologist in industry, I am sure, has a place—probably in a consulting capacity. It seems to us in industry that, where there is any considerable female personnel, there should be access to trained gynecologists of the female sex. At least, we find in larger metropolitan areas that there are a good many of those female gynecologists.

A woman physician has a part to play in industry, and is having just as much a part to play as the female who is processing materials and making products. I think the time has come when we have lived down the idea that nothing but male physicians would appeal to female patients. The female gynecologists have a place, and some of them are very excellent. I am not going to write recommendations along that line, but we find that we can satisfy an increasing number of our female employees who have dysmenorrheas or problems associated with the female pelvis through having them handled by female doctors, who are doing much better than we thought they could.

DR. L. HOLLAND WHITNEY, (Brooklyn): One thing that comes to my mind is the question of transfer from one department to another. It so happens that, in one of our departments, the operation requires the girls to stand in running the machine, and in the next department, which is not screened off, the girls sit down. We are beseiged by the usual number of requests for transfer from one department to another. In order for these women to be transferred they have to present a good medical reason, and they are sent to the medical department for that purpose. The epidemic which we recently had, and I am not sure it is not spread by word of mouth in the ladies' rooms, is that the standing job produces an excessive flow at the time of the menstrual period. I wanted to ask particularly if there is any scientific basis for that, and whether or not it may have any direct bearing on the problem of menorrhagia?

DR. POMMERENKE: I have little to say on that because I know of no experimental work that has been done. I don't think that ordinary standing work would change the amount of flow very appreciably. In certain pathological cases it might. But I know that women who stand a great deal in the usual run of their day's work oftentimes have no trouble; and many of them have trouble when they sit down a great deal. So I would have to answer that with a question mark.

CHAIRMAN WATSON: DR. POMMERENKE'S mention of the pregnant woman, that is, two months before parturition and two months after as being a satisfactory four months period for the woman, provided before and after that the approach can be handled in a reasonably decent supervisory fashion, brings up again the problem of supervision.

Who is going to supervise the female groups with the intent to determine whether or not they are pregnant unless you have a medical supervision that is pretty acute. This deserves real consideration. These women are not going to parade the fact that they are pregnant and are going to have a baby at a certain time, but somebody has to know about it to see that it doesn't come on before it should.

Nothing was said about the dysmenorrheac, who has to have something to make her feel better when she is having her period. It seems to me you can't dismiss it by saying, "You haven't a pain. It is customary. Women have had this problem and lived through it. It really isn't much discomfort anyway."

We feel there are a few little things that can be given; there are certain types of medication that are harmless and can be used. I don't think any medical department in an industry should hesitate to make use of these standardized safe things, provided they don't contain any isopropyl, barbituric acid, or similar substance.

Determining Margins of Safety

—Criteria for Defining a "Harmful" Exposure—

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THE control of the occupational environment to prevent harmful absorption of toxic materials is now a generally accepted principle by employers and employees. The practical problem of defining what is "harmful" presents certain difficulties, and it is well to begin with a discussion of the various criteria which have been used to indicate the degrees of injurious effects. Where a clearly defined severe systemic disease results from an exposure to harmful substances, there can be no question as to the need for measures which will decrease the degree of exposure. But as the environmental conditions are improved, a marginal zone is reached in which the injuries sustained are slight and quickly reversible, or amount only to a discomfort —tolerable, but unpleasant. It is in this zone that one finds the greatest controversy concerning the permissible limits of exposure.

It is good operating practice to control the working environment so that even these mild, transient injuries are prevented, and the discomfort is held at a minimum. An occasional slight anesthetic effect from the inhalation of ether or acetone may result in no permanent systemic injury, but workmen so affected are more liable to sustain accidents, and their working efficiency is impaired. A single, mild attack of metal fume fever—as from the inhalation of zinc oxide fume in the welding of galvanized sheet—may not be severe enough to cause a loss of time, but repeated and frequent episodes cannot be regarded as harmless. Certain substances in concentrations below that which will produce serious harmful effects, may cause moderate irritation to the eyes, mucous membranes, or skin. For example, amounts of chromic acid in the mists over chromium plating tanks which are not sufficient to cause systemic injury, may produce repeated irritation of the mucous membranes of the respiratory tract and destruction of a part of the nasal septum. Good operating technique is now directed at maintaining chromic acid levels below the point where these lesser injuries can occur.

The general trend in industrial hygiene control has been to eliminate, where possible, the environmental conditions which cause sufficient discomfort to interfere with the efficiency of the workman. The evaluation of "discomfort" is admittedly difficult, with psychogenic and aesthetic factors playing so important a part, and the individual response so variable. In certain instances, a further control of the environmental factors contributing to the discomfort is impossible, or, at least, extremely impractical, and a solution of the problem may be had by selection of workmen, usually by a trial and error method, who exhibit a high threshold with respect to the particular exposure. An extreme example of this approach is the case of a workman in a cafeteria, one of whose jobs was to carry out the garbage. Each time he performed this job he became nauseated and frequenty vomited. He reported to the medical department after a few days, complaining of these symptoms and of loss of appetite, and he had lost a few pounds of weight in the two weeks of employment. A careful examination revealed no other medical cause for his symptoms, and when he was transferred to other work (and incidentally, more strenuous labor) he regained his appetite and

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weight in a few days. There certainly was no toxic element associated with carrying out and dumping garbage, but the symptoms and loss of weight were no less real. The fact that many other individuals had performed, and subsequently did perform, this work without untoward results made the transfer of this employee a much simpler solution than any attempt to control the odors and visual stimuli connected with the job.

One aspect of the problem of occupational disease control which is receiving more attention is that of the relation of the industrial exposure to the possible increase in diseases which are not recognized as specifically occupational in origin, but which are common to the population in general. There are very few of the diseases which are definitely recognized as resulting from exposures to industrial toxins which have pathognomic characteristics, that is, signs and symptoms which are so specific and peculiar to the disease process that the diagnosis is made with such certainty that all other pathologic causes are excluded. When the signs and symptoms of an occupational disease are those which occur with considerable frequency in diseases commonly found in the general population, the picture is much more difficult. Impressions concerning such a relation, even by a competent and careful observer, are often very misleading. Adequate records with a proper statistical treatment and an intelligent, critical evaluation offer the greatest promise in an attack on this pertinent and important problem.

A frequently inaccurate guide as to the safety of an exposure is the statement of an "old-timer" on the job that there is no hazard connected with that operation. This criticism does not imply that such testimonials are valueless, but they must be scrutinized with care. A "natural selection" operates so that in certain circumstances, individuals who have been affected by an exposure to potentially harmful materials are eliminated from those jobs (sometimes only after receiving considerable injury) and the remaining personnel consists of the more resistant individuals. The causes which operate in these circumstances may not be recognized, in fact they frequently are not by the persons who remain unaffected, who, if they consider the eliminated workers at all, may regard them as "weak links who could not take it."

The Medical Examination

THE human body possesses the ability of absorbing a limited quantity of any substance without a demonstrable harmful effect. It is only when this tolerance—admittedly small for some compounds—is exceeded that injury results. With certain materials the margin between harmless absorption and severe or even fatal injury is a narrow one. With other substances, large amounts can be absorbed with impunity, or a greater latitude may exist between the quantity which first produces minor injury and that required for a fatal effect. Complicating these relationships are many variables, such as the rate of absorption; the rate of elimination; the rate of recovery from injury by a tissue, organ, or system; and the variability among individuals and in the same individual at different times. In spite of such a complexity it is possible and practical to define certain safe conditions of exposure to a great variety of substances which are found in industry.

The medical examination of the workmen exposed is an essential factor in the evaluation of an exposure, since all of the information gained from a study of the environmental factors has significance only in relation to the medical findings. An industrial hygiene control program cannot insure its effectiveness without such a medical examination, since its ultimate value must depend upon securing the health of the workmen. Frequently, when this integrated information has been sufficiently verified, the analysis of the environmental factors may play a very important or even the chief part in the mechanism of control. The advantages and limitations of such environmental studies will be discussed later.

The scope of an adequate medical and industrial hygiene examination will depend upon the nature of the exposure, determined by such factors as the completeness of information from previous studies, the correlation with environmental analyses, and the nature of the pathologic changes revealed by clinical and experimental research. For example, the medical control program for an exposure to silica dust may depend largely upon analyses of the breathing-zone air and of x-ray examinations of the lungs. Many industrial exposures to silica are now satisfactorily controlled chiefly by repeated air analyses, but the physical examination, including the roentgenogram of the chest, must be made at intervals to insure the efficacy of the environmental studies. When, however, a new chemical, the injurious effects of which are unknown, is introduced, a more comprehensive medical examination is indicated. Experimental studies on animals frequently give invaluable suggestions as to the pathologic effects, and consequently the type of studies which are likely to indicate the earliest signs of injury, but the occasional marked discrepancy between the effects on various species places a definite limitation on this type of information. The examination of individuals exposed to a new, potentially toxic material, should be frequent and comprehensive until there is reasonable assurance that no harmful effects are occurring. The period of probation for the new substance may necessarily be a long one. Experience with a chemical such as beta-naphthylamine has shown that relatively small amounts —amounts too small to elicit evidence of a general toxic effect—may produce serious injuries (in this case, tumors of the bladder) only after a period of years. While these exceptions are fortunately rare, they must be kept in mind in assessing the toxicity of a compound.

The medical examination which should be employed to detect the earliest signs of injury from an industrial toxin differs in some respects from that which is generally used in medical practice. Unfortunately many of our medical tools are not sufficiently acute to detect the very earliest evidences of functional failure. In addition, there is an overlapping zone between areas of values which are definitely normal and those which are certainly abnormal. Since industrial exposures often involve many individuals, statistical methods are particularly applicable. If a single individual presents a value for a physiologic characteristic which falls in the marginal zone between the normal and abnormal, it may be difficult to evaluate it, but such a statistically significant deviation occurring in a group of individuals may indicate a common influencing agent—perhaps an industrial toxin. The industrial hygiene medical examination may differ, too, in including some special tools, usually laboratory procedures, such as the determination of lead, mercury, selenium, or an organic dye. Their applications to industrial medicine differ in degree, in that they become routine tools for controlling the absorption of potentially toxic substances, and not measures for the diagnosis of a disease.

The use of statistical methods has required a careful development of norms. It must be emphasized that the values frequently quoted in textbooks of laboratory

medicine are unsuitable, and the investigator must verify the ranges of values for each of the characteristics studied in the particular plant population being examined. The norms for the industrial population will not necessarily agree with those frequently given as "normal," since the former should be derived from a typical cross section of the particular industrial population and should include values from individuals who are suffering from the minor diseases found in an ambulatory working group, but should exclude values from individuals with exposures to potentially toxic materials until it has been demonstrated that those individuals as a group fall within the statistical limits of the control group. An extreme example of faulty choice of normal values is contained in an article on benzene poisoning appearing in one of the better journals a few years ago. The author's criteria of a normal erythrocyte count range was from 4,600,000 to 5,400,000; that is, values below and above this range were considered abnormal, and, in individuals exposed to benzene, indicated a toxic effect. The author did not limit his data to a particular population, with the implication that the standards apply generally. The absurdity of such limits is seen when a comparison is made with the values given below. It will be noted that about half of the erythrocyte count values for this control group would be classed as abnormal under the too rigid criteria set in that author's study. These ranges of "normal" are from studies made on a plant population in Rochester, New York, and include males only, between the ages of 18 and 65. They are presented here only as an example of the "normal" values obtained by a comprehensive industrial hygiene study, and should not be applied to studies of individuals from other populations without specific verification.

NORMS

MALES, 18-65 YEARS, ROCHESTER, NEW YORK

	Range (M ± 2 S.D.)
Hemoglobin	13.8-17.2
Erythrocyte count	4,600,000-6,400,000
Cell volume (Hematocrit)	42.6-53.0
Mean corpuscular hemoglobin	24.3-32.3
Mean corpuscular volume	76.3-98.3
Mean corpuscular hemoglobin concentration	29.2-35.6
Leukocyte count	4,500-11,000
Schilling index:	
Polymorphonuclears	38-74
Lymphocytes	16-50
Monocytes	3-13
Eosinophiles	0- 7
Basophiles	0- 2
Reticulocyte count	0- 1.0
Icteric index	1- 7
Sedimentation rate	0-23

Abnormal physical signs are of much greater value in diagnosis than symptoms. The latter are so frequently colored by the opinions of associates, by misinformation from many sources, by the approach of the examiner, and may take on an epidemic form if the suggestive factors are strong enough. They should be elicited and carefully considered, but their notorious unreliability gives them a secondary value. The physical examination may include a variety of special techniques, such as the electrocardiograph, the x-ray, etc., as indicated. A recent development by Dr. John Foulger and his associates makes use of the data obtained from repeated examinations of the blood pressure and pulse rates in identifying the early effects of toxic materials. The evidence presented thus far by his studies shows that this may be a useful and easily applied tool in controlling group of individuals in potentially toxic exposures. He properly emphasizes the desirability of having a method which will reveal early reversible functional changes. Further critical study of the method by other competent observers is necessary before it can be generally accepted as having the significance attributed to it by Dr. Foulger, but it certainly merits a broad trial.

Among the control measures which are extremely useful are those procedures for determining the amount of a foreign substance in the blood or excreta, or of an abnormal metabolite or change in the excretion ratios of a metabolite. An excellent example of the former is the determination of lead in the blood or urine of individuals exposed to that substance. Analytical procedures have become so acute that lead is now found in practically every urine specimen, and a certain amount is regarded as normal. As increasing amounts of lead are found in repeated specimens the probability of the individual developing evidence of lead intoxication increases, and the correlation of quantitative analyses with clinical data has made possible the definition of certain excretion levels, below which there is little likelihood of finding intoxication. The application of this procedure in industrial hygiene is primarily preventive—and not, as it usually is in regular medical practice, a diagnostic one. Careless and incorrect application of the procedure had led in some cases to an improper censure of its value, but there are many competent industrial hygiene laboratories which find it of real worth.

An example of the value of this type of procedure, even where the safe levels of excretion are not known, is this instance from our experience. A chemist was synthesizing an organic compound containing selenium, and, more out of curiosity than a real expectation of finding appreciable quantities of selenium, we asked him to submit a urine specimen. Methods for determining selenium in urine had been worked out by several laboratories in connection with the problem of selenium poisoning ("alkali disease") in animals in the great plains area of this country. In the analytical procedure, the selenium is precipitated as a red material, which if present in more than a few micrograms gives a reddish turbidity to the solution. The first urine specimen precipitate gave an appearance of tomato juice, as did several subsequent samples collected with every possible care to prevent accidental contamination. An investigation was started to determine how absorption occurred. The possibility of accidental ingestion was eliminated, and analysis of breathing zone air showed that inhalation could not possibly account for the large amounts excreted. It was finally proved that the major route of absorption was through the skin, and in subsequent experimental studies it was shown that from 5% to 10% of a given amount applied to a skin surface was absorbed in a half hour's exposure. Although it was demonstrated in animal studies that selenium tied up in this particular organic compound was less toxic than inorganic selenium compounds such as sodium selenite or sodium selenate, the really considerable amounts which could have been absorbed over a period of time might well have resulted in severe injury. All of the individuals exposed during the synthesis or subsequent handling were required to submit frequent urine samples, and the relationships between absorption and excretion were worked out so satisfactorily that we could tell the individual the time within a half hour that an excessive exposure occurred. The results of the analyses were shown to the individuals exposed, and careful attention to technique in handling kept the absorption at a minimum. The collection of data from complete serial medical examinations over a period of years has shown that certain levels of excretion in excess of the normal

selenium excretion may not be associated with any evidence of injury, and that it is practical to control the exposures so as not to exceed these arbitrary levels.

The determination of the urinary organic-inorganic sulfate ratio in exposures to benzene is a good example of a control method which utilizes a change in the ratio of excretion of a normal metabolite as an indication of excessive absorption. Normally from 75 to 90% of the total urinary sulfate is present as inorganic sulfate, and the remainder as organic or etherial sulfate. When there is an excess of phenolic compounds in the body, sulfate combines with a portion which is then excreted through the kidney—one of the normal detoxication mechanisms. When benzene is taken into the body, a portion is oxidized to phenol and is subsequently excreted, at least in part, as the phenolic sulfate. Since the amount of sulfate available is limited, and the phenol takes precedence in combination with sulfate over inorganic radicals, the proportion of organic sulfate to that of inorganic in the urine rises, and the per cent of inorganic sulfate may drop to 50 or 25, or even approach zero. It has been shown that, in a group of individuals with an exposure to benzene, those having consistent organic sulfate percentages greater than 50 rarely give any evidence of benzene intoxication, and that the lower this percentage falls, the greater the likelihood of encountering cases of poisoning. The relationship between the sampling time and the exposure must be properly considered, and the tests must be performed often enough to indicate the true exposure if reliance is to be placed upon them as an important factor in the control program.

Analysis of Environmental Factors

IN RECENT years more and more emphasis has been placed upon the analysis of the environmental factors as a means of controlling the hazards to toxic materials. This approach has developed slowly and is the outgrowth of initial studies made to determine the concentration of a material which actually caused an intoxication. The next step was obvious—the determination of concentrations to which individuals were exposed and which were not associated with evidence of injury. Gradually a considerable body of data has been accumulated for a variety of compounds, giving levels of exposure which have not been associated with injurious effects. The values more generally used are those which apply to a continuous exposure. By the term, "maximum allowable concentration" is meant the upper limit of concentration of an atmospheric contaminant which will not cause injury to an individual exposed continuously during his working day and for indefinite periods of time. For a limited number of substances, upper limit concentrations have been suggested for shorter, specified periods. Frequently, these latter values have the purpose of limiting the "peak" concentrations frequently found in industrial operations.

"Maximum Allowable Concentrations" (MAC) are usually defined in one of two ways: (1) Parts per million (p.p.m.) and (2) milligrams per cubic meter (mg./meter^3, or mg./cu. meter). Occasionally the latter is given as milligrams per 10 cubic meters (mg./10 meters^3)—the volume of air breathed by an average individual in eight hours at a moderate rate of work. The former classification, parts per million, is commonly used for gases and for vapors of solvents; the latter description, milligrams per cubic meter is usually applied to the fumes of metals and sometimes to the fumes and vapors of other solids and heavier liquids. Parts per million denotes the relationship of the *gas* volume of a substance (i.e., the volume occupied by the substance in a completely volatile state) and must not be confused, as is frequently the case, by taking the *liquid* volume of the solvent to the total gas volume of the containing air. At 0° Centigrade and 760 mm. pressure, 1 gram-molecule (the molecular weight in grams) of a substance occupies approximately a volume of 22.4 liters. For example, 154 grams of carbon tetrachloride (molecular weight of CCl=154) would occupy at 0° C and 760 mm. a volume of 22.4 liters if completely volatilized, but as a liquid, only a volume of 0.096 liters. Thus if, by error, the MAC for carbon tetrachloride was calculated using a liquid-gas ratio, the resulting "permissible" concentration would be 233 times the present accepted level.

The setting of such threshold values for the working environment which are consistent with the safety of the workmen, offers several real advantages. It permits a control of the environment in such a manner that the likelihood of injury is reduced to a minimum. It allows a more accurate use of engineering methods, by indicating the requirements which must be met by devices for ventilating, inclosing or otherwise controlling the hazardous materials. It facilitates a more accurate governmental inspection and regulation of the exposure.

It must be emphasized that the MAC values are not absolute, immutable. A few are based upon a considerable amount of careful clinical evidence, but many are very tentative in character, and are meant as nothing more than the best estimate as to a safe level. The values are being, and should be, constantly revised as new evidence is presented to indicate that lower values must be set to safeguard the health and safety of individuals exposed, or that higher levels are safely permissible. There is always a danger that the values will be so "frozen" by time and usage that the newer, more accurate data will be ignored. This is especially so when the values are incorporated in codes by the various governmental agencies, and these codes have the force of law and the consequent fixation which characterizes such facilities. These dangers place a responsibility upon the individuals in charge of guiding the governmental control regulations, but thus far, in the main, the activity has been well considered and reasonable.

The need for a competent and authoritative body which would consider the data available and agree upon an MAC value for each substance as soon as there was a sufficient and accurate volume of information to warrant it, has been met by the creation of an American Standards Association Committee, whose object is "to determine, establish, and promulgate the allowable concentration limits of harmful gases, vapors, fumes, dusts, and mists; and other subjects related to the allowable concentration limits of such substances in the atmosphere of working places from the viewpoint of occupational disease prevention." This committee includes a very fortunate selection of competent authorities in this field, and represents a good cross-section of governmental, insurance, and industrial agencies. Standards have been set for several common toxic agents and many more are under consideration. The chief dangers here are that the values set will connote an absolute character which should not be a part of this type of standard, and that such an organization may be slower to revise the limits because of reluctance to weaken the authority of such standards.

A criticism of the validity of atmospheric analyses has been made because of the difficulty of getting a true sample of the air actually breathed by the workmen. Many types of sampling equipment cannot follow the breathing zone of the exposed workman, and where

there is a considerable gradient of the concentration, the sample may not even approximate the true exposure. In such cases, a head band sampling apparatus, which actually samples near the nose of the operator may give a value which is representative of the true exposure. In any case, improved techniques will obviate this criticism.

The tendency to rely entirely upon the analysis of environmental factors in industrial hygiene control has been justly criticized. As pointed out earlier, an effective control may be accomplished largely by dependence on the measurements of atmospheric contaminants when there is a sufficient knowledge of the safe permissible limits, but the individuals exposed must have adequate and serial medical examinations to insure the competence of the program. The possibility of accidental ingestion of the toxic agent, of its absorption through the skin, must always be considered, and here obviously the reliance upon atmospheric analyses may be dangerously misleading.

With these virtues, and limitations, in mind, the accompanying data are presented. The first important publication of these maximum allowable concentration values in this country was in 1939 and 1940, and represented the consensus of opinion of a number of industrial hygiene authorities. Most of the values given were taken directly from those lists or are revised limits, accepted from more recent and apparently more accurate studies, or are revisions made by the author after personal experience and conference with others who had special knowledge of the particular material. It is recognized that the presentation of data which differ from those already published may increase the confusion, but, where a new value has been suggested, it is the author's opinion that further study is necessary, and that the expression of a different limit, which seems more closely to approximate a proper one may stimulate additional investigation and eventually result in a more accurate standard.

Since it is difficult to visualize the relative amounts of material in a given concentration from the "parts per million" a calculation was made of the approximate liquid volume of each solvent which would be equivalent to the given MAC in an arbitrary space. (See Table opposite.)

In the second column is shown the liquid volume which if volatilized and distributed equally would give a concentration in a space 10 feet x 10 feet x 10 feet (1000 cubic feet) equal to the maximum allowable concentration for that substance. For example, 11.1 cc. of carbon tetrachloride if volatilized and distributed equally in 1000 cubic feet would give a concentration of 100 p.p.m., the generally accepted MAC for this solvent. While this data may be used to roughly calculate the amounts of a substance that may be safely volatilized in a room of a given dimension, it must be emphasized that even though the proportions given are not exceeded, the concentration at any one point (for instance near the point of generation) may be greater than the permissible limits. The only safe method for determining an atmospheric concentration is to make actual analyses at the *breathing zone* of the individuals exposed.

M. A. C.

Vapor or Gas	Parts per million (p.p.m.)	Cubic centimeters in 1,000 cubic feet
Acetic acid	10	
Acetone	1500	129.5
Ammonia	100	
Amyl acetate	400	68.6
Aniline	5	0.5
Arsine	1	
Benzene	100	10.1
Butyl acetate	400	60.9
Butyl alcohol	100	10.6
Carbon bisulfide	15	1.1
Carbon monoxide	100	
Carbon tetrachloride	100	11.1
Chlorine	1	
Dichlorobenzene	75	9.8
Dichloroethyl ether	15	2.1
Ether	400	48.0
Ethylene dichloride	100	9.1
Formaldehyde	20	
Gasoline	1000	170.3
Hydrochloric acid	10	
Hydrogen cyanide	20	
Hydrogen fluoride	3	
Hydrogen sulfide	20	
Methanol	200	9.4
Monochlorobenzene	75	8.9
Nitrobenzene	5	0.6
Nitrogen oxides	50	
Ozone	1	
Phosgene	1	
Phosphine	2	
Sulfur dioxide	10	
Tetrachloroethane	10	1.2
Tetrachloroethylene	200	23.7
Toluene	200	24.5
Trichloroethylene	200	20.8
Turpentine	200	34.7
Xylene	200	28.4

Fume	Milligrams per cubic meter
Cadmium oxide	0.1
Chlorodiphenyl	1.0
Lead or oxides of lead	0.15
Mercury or mercury compounds	0.1
Pentachloronaphthalene	0.5
Trichloronaphthalene	5.0
Zinc oxide	15.0
Welding fumes from ferrous metals	25.0

Dust	Million particles per cubic foot
Asbestos	5
Cement	100
Gypsum	100
Lead or compounds of lead	0.15*
Manganese	6.0*
Marble	100
Silica (free silicon dioxide)—	
Class I (more than 10% free SiO_2)	10
Class II (less than 10% free SiO_2)	100
Talc	100

*Milligrams per cubic meter.

Mist	Milligrams per cubic meter
Chromic acid	0.1
Sulfuric acid	5.0

REPORTING in *Forbes* on a recent study of personal time lost at General Motors plants since October, 1941, Andrew Court says that absenteeism, which has been impairing war production, is largely of a short-time nature and can generally be traced to a minority of 10% to 20% of the total working force. The short-time absence rate has doubled since Pearl Harbor, with male workers now accounting for 3% of the average short-time personal absence and women for 5%. . . . It is greatest around the week-end. In contrast to the short-term trend, serious sickness—that lasting more than a week—showed no upward tendency. Wartime shortages and strains have not produced the anticipated spurt in serious illness; nor are industrial accidents and increased fatigue, due to longer working hours, causes of the rise in short-time absence. "Numerically speaking the more important chronic offenders are the men in the youngest age groups (and to a lesser extent, the single men and women of any age) many of whom have few or no family responsibilities. . . . The motives behind the behavior of this group become clearer when considered in the light of economic conditions."

—From Connecticut General's *Notes and Quotes*, July.

Toxic Products and Their Control

—A Plan for Use in an Industrial Plant—

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1. The Problem

THE PROBLEM of the safe use of toxic materials in industry today is complicated by several factors:

(a) The enormous increase in the number of individuals working in wartime industry makes it inevitable that many of these individuals will not have had previous industrial experience, and their knowledge with regard to personal safeguards will be extremely limited.

(b) The rapid upgrading of employees to foremanship and assistant foremanship positions will of necessity result in many of these people, lacking experience, being unequipped to properly supervise all of the controls necessary to the complete functioning of their departments.

(c) The manufacturers of products used in industry many times must of necessity change the formulae of their compounds because of inability to obtain chemicals which they have previously used in fabricating their products.

(d) The general rush and hurry in war industry plants is such that unless strict precautions are set up under rigid control there is a tendency to thoughtlessness and carelessness which, while not intentional, can be very destructive when substances causing toxic reactions are used.

Since we cannot avoid hiring inexperienced employees, nor can we instantaneously create foremanship ability in the individuals advanced to foremanship positions, it is necessary to exercise a greater degree of control over the use of toxic materials or suffer an increase in the disabilities caused by the improper use of such materials.

2. A Solution

BECAUSE of the factors enumerated above it is necessary to consider the problem of toxic materials primarily from the standpoint of the prevention of absorption rather than treatment of intoxication from these substances involved.

The first step in the procedure is to establish an understanding of the problem and to obtain the cooperation of the purchasing, safety and medical departments.

The second step is to make a complete survey of the plant in all departments to determine what substances are already in use.

The third step is to contact the manufacturers, who will almost universally be very cooperative in giving the medical department or the purchasing department a statement of the toxic constituents of their products and the percentage and common chemical names of these substances.

In the event that the manufacturer of certain products is not willing to divulge the formula of his material it will be necessary to analyze it in the laboratory to determine the constituents.

The fourth step is to then consult with the engineering or other departments which may be involved to determine what relatively non-toxic materials may be substituted for those which are quite dangerous. For example, it may be possible to substitute steam degreasing for a process involving the use of trichlorethylene or other very toxic materials. Again, it is frequently possible to substitute alkaline paint removers for those containing benzol or other aromatic hydrocarbons.

The fifth step then is to have the safety engineer become cognizant of the dangers involved in the use of each individual toxic material and to establish a procedure whereby the use of the proper protective equipment is made mandatory in the department wherein this toxic material is to be used.

The sixth step is to consult the best available sources of information with regard to toxicology and establish laboratory procedures in the medical department for the routine checking of all personnel working with these dangerous materials.

The last step is that there must be a method established whereby when an employee exposed to toxic materials shows any evidence of intoxication therefrom, the industrial relations department will arrange his transfer to another job within the plant for a period of time sufficient to assure recovery from whatever degree of intoxication may have become apparent as the result of laboratory examinations.

3. The Procedure Followed

IN THE San Diego Division of Consolidated Vultee Aircraft Corporation there is a standard practice instruction which carries the authority of an order from management that the following procedure be established and maintained, to wit:

That all vendors of materials to this division shall be contacted by the purchasing department and requested to furnish, as confidential information, a notarized statement of any toxic constituents of their products, the percentage of these toxic constituents, and their common chemical name.

Before this material is purchased this information is forwarded to the chief surgeon so that he may determine the danger involved in the use of this material and establish laboratory procedures for the determination of intoxication from continued exposure to the material.

The chief surgeon then contacts the safety department through the general safety committee, and a procedure is established and all safety precautions are pre-determined whereby the use of this material will not jeopardize the health of the employees who are exposed to it.

After this procedure is set up the purchasing department is notified that the product is usable and the order is placed for the material. Thus, no toxic material may be used in this plant until all safeguards and precautions are established for its use in advance of its introduction to the plant.

The purchasing department also advises the vendor that, in the event of a change in the formula of his product, the purchasing department shall be so advised, and a new letter similar to the original be sent to the purchasing department.

4. Summary and Conclusions

A RIGID control over the use of toxic products is demanded under present wartime conditions because of the lack of training, both on the part of employees and foremen in the average war plant, and because of the possibility that wartime restrictions may cause changes in the formulae of well known compounds in common use.

(b) Intoxication resulting from the use of toxic products may be prevented by carefully controlled operations involving cooperation between the purchasing department, and the medical and safety departments.

(c) Since the inauguration of this system of han-

dling this type of material in the San Diego Division of the Consolidated Vultee Aircraft Corporation there has not occurred a single case of serious intoxication from exposure to any toxic material throughout this large plant.

Chlorinated Naphthalenes and Diphenyls

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THE chlorinated naphthalenes comprise a group of chemical substances made by the addition of various amounts of chlorine to a naphthalene base. The amount of chlorine may vary from three to six or possibly more atoms providing compounds from trichlornaphthalene to hexachlornaphthalene.

In the same manner, the varying amounts of chlorine are added to a diphenyl base providing a group of compounds of varying chlorine content.

As a rule, the final substances, as used in industry, are mixtures of differing chlorinated naphthalenes. Earlier, these were, as a rule, possessed of a lower degree of chlorination and later on the compounds were usually of a higher degree of chlorination with varying amounts of chlorinated diphenyls added thereto.

These substances are not new. Perchlornaphthalene was used in Germany during the last war.

It is to be clearly understood that these groups of compounds are not manufactured by any one company but rather by approximately five in the United States, and they are sold under varying trade names by the manufacturers.

The chlorinated naphthalenes and diphenyls are valuable industrial products. Because of certain properties which they possess, we may briefly state these valuable properties as follows:

1. Resistance to water and alkali.
2. High insulating value. They possess high dielectric constant.
3. Thermo plasticity.
4. Quite stable chemically.
5. Flame resistant.

For these reasons, these substances possess much value industrially in the making of electric condensers, and in the insulation of wire and cable, etc.

Method of Use in Industry

THE chlorinated naphthalenes and diphenyls are used in industry by two methods:

1. A cold method in which the material is dissolved in a solvent usually a mixture of petroleum naphtha and toluene, and
2. A hot method wherein the material is rendered plastic by heat.

Toxic Effects

IN THE United States, the first three cases of acne produced by chlorinated naphthalenes were reported by Sulzberger[1] and his co-workers in 1934. Fulton and Matthews,[2] of the Pennsylvania Department of Labor, reported 101 cases of dermatitis in a wire insulating plant in 1936.

In 1936, Dr. Louis Schwartz,[3] of the United States Public Health Service, described cases of acne produced by chlordiphenyls, and in the same year, Jones and Alden[4] reported similar findings.

In 1938, Mayers and Silverberg described acneform skin eruptions in workers making electrical condensers.[5]

Time does not permit a discussion of the histology of these dermatological changes produced by this substance.

In general, it can be said with a fair measure of certainty that these changes are brought about in the skin, primarily by the contact of the skin with the vapors of these compounds, or by actual contact with them in the form of solid or particulate matter. We have found, for example, that workers exposed to fumes have more acne than those exposed to dust alone, and we have also found that workers exposed to the solid material or its particulate form have developed dermatitis. In this connection, the report of Fulton and Matthews is very interesting. They picture and describe a case of an infant, 2½ years of age, who developed the dermatitis as a result of contact with the soiled working clothes of its father who was in the habit of playing with the child prior to changing his clothing.

More recently, Schwartz[6] has described cases of dermatitis among cable strippers employed at shipbuilding establishments and working with cables which had been impregnated with these compounds.

Systemic Effects

IN THE United States, systemic effects in the form of acute yellow atrophy of the liver were reported by Flinn and Jarvik[7] in 1936 among men working with tetra and pentachlornaphthalene. These findings were verified by animal experimentation. In 1937, Drinker, Warren and Bennett[8] reported such liver changes among animals exposed to the material by inhalation, and similar findings were obtained with the chlorinated diphenyl compounds. These latter authors also mention four non-fatal cases among humans and the three fatal cases previously cited by Flinn and Jarvik.

I should like to cite two or three cases which we have encountered in our own experience[9] and which may be of interest from the point of view of duration of exposure prior to this type of poisoning. A girl 17 years of age was engaged in soldering electrical condensers which were impregnated with tri- and tetrachlornaphthalene for a period of approximately seven months. The autopsy for this case showed mild to severe degeneration of the liver and presented a clear picture of what is generally known as acute yellow atrophy. It was apparent in this case that the latter organ displayed areas of healing and new areas of pathology.

In the second case, a man 24 years of age developed jaundice after five months of exposure in the coating of wires with wax containing the higher chlorinated naphthalenes. He was away from work for a period of time and four months later the jaundice became quite intense, with general malaise and loss of appetite. After two months more of work he was sent to the hospital, where he rather rapidly passed away. The autopsy in this case showed extensive areas of necrosis and fibrosis of the liver with regeneration.

In a third case, published by Drs. Mayers and Smith,[10] of the staff of the New York State Department of Labor, an 18 year old girl became ill after five months of exposure in the soldering of electrical condensers. The waxes in this case were composed principally of trichlornaphthalene. She was hospitalized and recovered after a long and slow period of convalescence.

Recent Industrial Experience

DURING the past year the Division of Industrial Hygiene of the New York State Department of Labor has conducted an investigation in two cable plants using chlorinated naphthalenes and diphenyls. In this

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Round Table Discussion, Regulation in the Use of Toxic Substances, NATIONAL CONFERENCE OF GOVERNMENTAL INDUSTRIAL HYGIENISTS, Rochester, New York, May 24, 1943.

investigation, a large number of cases of dermatitis were found, and several deaths due to liver damage among workers in the industry.

The examination of workers in the two factories showed relatively few cases of enlarged liver—five in all, on palpation.

Comparison in these two plants showed a very much higher incidence of acneform dermatitis in one of the plants as compared with the other; namely 21% as compared with 60%, the former being in the cold process establishment and the latter being in the establishment employing the hot process only. The dermatitis appeared to take place on the average in about 7½ months in the hot process plant as compared with 10 months in the cold process plant.

Conclusions

AS A RESULT of our general re-study of this whole problem and our experience in two recent outbreaks, as well as several isolated experiences we desire to draw several basic conclusions:

1. Chlorinated naphthalenes and diphenyls are in general highly toxic compounds and must be used with extreme care. Industrial hygienists should make every effort to see that such exposures are controlled, in so far as humanly possible. In this effort, we do not believe it safe to rely on limiting atmospheric concentrations but rather to depend on a maximum of maintenance and engineering control.

2. Toxic exposures may be more readily controlled where the cold or solvent method of impregnating cable is employed than where the hot process is used.

3. Of the known cases of liver disease in our experience, the available history and experience generally points to exposure to vapors or fumes from the hot process. There is no clear evidence in our experience, although it is possible that skin absorption may produce systemic poisoning. Physiologically we see no reason why this is not possible. However, most dermatitis cases do not develop liver damage.

Finally, I should like to call attention to a group of recommendations which were agreed upon by all of the groups involved in the last outbreaks of poisoning as being of utmost importance in control of this hazard.

Recommendations

UNLESS there is a very good reason for using the hot method of impregnation all new installations should use the cold or solvent method of impregnation with chlorinated naphthalenes and diphenyls. Where the hot method is now being used it should be changed over to cold, if possible, or surrounded with every known protective measure.

2. General hygienic measures should be followed, but in no case should these be allowed to supersede engineering control of the primary source of the exposure, the operations in the plant.

The following hygienic measures may be considered good practice where these compounds are handled.

(a) Two lockers for each worker exposed to chlorinated waxes (one for working and one for street clothes).

(b) All work clothes above the underwear should be provided and laundered at least twice a week by the management.

(c) The workers should change to clean underwear at the end of each shift before getting into his street clothes.

(d) Supervised cleaning: (1) At noon the workers should remove outer clothing and scrub hands and face under supervision. (2) At the end of the shift they should be required to take a supervised shower before changing back to street clothes.

(e) Protective skin creams or protective clothing should be provided by the management at the discretion of the foreman, nurse, medical, or plant superintendent.

(f) All departments handling chlorinated synthetic waxes should be thoroughly cleaned according to a prearranged schedule. This should include the removal of all deposits of waxy material from the machines, floors and surrounding objects. Workers doing the cleaning should be provided with protective clothing and supplied air or organic vapor masks where exhaust ventilation is inadequate or not possible.

3. The foremen of all departments where this material is handled should be apprised of the toxic nature of the material and instructed in safe handling procedures. These men should make it their duty to check up on the workers in their departments and instruct them in safe practice.

4. Pre-employment and periodic physical examinations should be made of all exposed workers. These should include the taking of a full clinical history, with special emphasis on gastro-intestinal disturbances and dermatitis. In addition, the skin should be carefully examined periodically and the more reliable liver function tests performed. Gastro-intestinal complaints developing in a worker at any time should be a signal for an immediate medical check-up. A history of liver disease, jaundice, or antisyphilitic treatment should automatically exclude a worker from jobs involving a possible toxic exposure. Pregnant women should not be employed where there is a possible exposure to the synthetic chlorinated waxes.

5. Engineering control of plant operations cannot be overemphasized but specific recommendations are not applicable to all cases. It would be wise for a plant using this class of materials to check their control measures with the state industrial hygiene agency, the insurance carrier and some competent consultant before occupational disease occurs.

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Abstract of Discussion

MANFRED BOWDITCH (Boston): A few issues ago an article appeared in the *Journal of the American Medical Association* dealing with that subject of cable wire treating. One of the two authors is here; he might say a word or two on that subject.

DR. IRVING R. TABERSHAW (Boston): Those were experiments to remove wax from the skin, and, as you know, it is practically impossible to get off. DR. GREENBURG mentioned scrubbing, but that doesn't do it. As a matter of fact, workers themselves have attempted everything, even washing their faces with ether and using the harshest abrasive soaps.

We evolved a mixture which effectively removes the halowax from the skin, consisting of equal parts of butyl stearate and sulfonated castor oil. A little cornmeal is added as a mild abrasive and oleic acid is used to hold it in suspension. It is very effective in removing halowax.

We have not used it as a curative measure, although it can be used that way. However, if a case of halowax has once developed and is removed from exposure entirely, it takes three months or longer to clear up.

We have also found ultra-violet to be of some help. It is not completely efficacious in clearing the condition, but it does help, and, in my estimation, it helps as much as x-ray.

The crux of the situation is cleanliness, and, as DR. GREENBERG stressed, it is necessary to do it under supervision. Perhaps the use of this mixture might help in removing the halowax before the worker leaves.

DR. LLOYD M. FARNER (Seattle): I would like to ask DR. TABERSHAW to answer an observation we made in the state of Washington. We had 60-odd cases of cable dermatitis, and, interestingly enough, these cases were among men stripping cables in the shipyards. We saw not a single lesion of pore acne on the hands, and yet the hands were the most exposed part of the body.

We felt very definitely that the washing of the hands with plain soap and water was the reason we saw no lesions on the hand, because the men rubbed their ears and their faces, and the other parts of the body were exposed to the wax that adhered to and went through the clothing.

We saw lesions everywhere except on the hands. I would be interested in getting your reaction, Doctor, as to why that situation existed.

DR. TABERSHAW: Of course, it occurs chiefly where the sebaceous glands are present—ears, crevices along the eyes and face. As DR. GREENBERG pointed out, it develops along any abrasion or sebaceous gland. I can't explain it except they must have cleaned their hands very thoroughly.

DR. GREENBURG: I think you can wash this material off your hands. It is difficult to get any results once you develop pore acne. I believe those cable strippers did wash their hands thoroughly before they developed pore acne, and they prevented it from developing in the hair follicles in the hands, where it often occurs, in the sebaceous glands there. I think that is why you find pore acne on the body where it has penetrated through the clothing, around the neck and sometimes on the face. After it has developed, washing doesn't do very much good. Then you are up against a case where the skin is loaded down, and you have to get rid of it by some other more radical procedure.

Wartime Industrial Medical Services

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THERE is little factual information regarding the status of industrial medical service since this country entered the war. Something is known concerning the medical organizations created to care for the needs of the very large new war plants, but little has been published concerning establishments with less than 5,000 employees which, after all, are carrying a large share of war production in this country. Comparisons of medical services found in plants of corresponding size but in different industries are still more rare.

The Division of Industrial Hygiene of the National Institute of Health is fortunate in having participated during 1942 in two surveys which throw some light upon the important problem of wartime industrial medical services. Nearly a thousand establishments located in 36 states and employing approximately 2.5 million workers were included in these surveys. More than four-fifths of the 962 establishments included in the present report were covered in a study which was primarily concerned with industrial nursing but necessarily included some data pertinent to this report; data from the remaining plants were secured from a study dealing more specifically with industrial medical services. Since definitions regarding medical personnel and facilities were the same for both studies it was possible for present purposes to combine the schedules for these items.

It should be kept clearly in mind that all establishments covered by the two surveys were chosen because they had some organized medical services already in existence in 1942. Obviously the majority of them had at least a full-time industrial nurse. At the time they were surveyed a large proportion of these establishments were engaged in or were in process of changing over to essential war activities. Approximately a third were located in the New England and the Middle Atlantic states, a half were in the Middle West, and the remainder were in the Pacific Coast states and in the South.

Within the limitations stated above these data should represent reasonably well conditions actually existing during the first year of the war. The topics chosen for discussion are of such nature that quantitative measures are readily available. No attempt has been made to evaluate the quality or the efficiency of the medical services being rendered in these plants. This paper aims merely to describe certain facts pertaining to the medical personnel, medical services, dispensary facilities, workmen's compensation and sick benefit plans, and the type of food service found in establishments according to certain size and industry groups. Comparisons by industry have greater significance when they are limited to establishments within the same broad size group.

Medical Personnel

THE medical service personnel of an establishment is considered to include all of those individuals employed or retained by the company officials to render medical care to the employees. Persons engaged in a specified activity for a regular work day, every day in the work week, are classed as full-time employees. Persons having regular hours of duty in the plant each week which are less than the entire period are classed as part-time employees. On-call physicians serve no regular hours at the plant but are called from a prepared list or panel whenever an emergency arises. All plants which had a full-time registered nurse, but no full-time or part-time physician, were considered to have a physician on call even if they did not so state on the schedule. No distinction has been made between part-time physicians who are at the plant for only one hour a week and those who spend several hours each day at the plant.

Of the 962 establishments included in Table 1, 39% had only an on-call physician, 43% had a part-time physician, and 18% had one or more full-time physicians. In Table 2 which considers each of these three groups separately, it is found that 12% of the plants with an on-call physician had no full-time registered nurse but depended on a practical nurse, first-aid worker, or part-time registered nurse for duty in the dispensary. Seventy per cent of these plants had a full-time registered nurse without other assistance, and 18% of the plants had a full-time registered nurse plus other assistance usually on the night shift when the regular nurse was not on duty.

Of the 414 establishments with a part-time physician, 6% had other attendants but no full-time regis-

From the Division of Industrial Hygiene, National Institute of Health, United States Public Health Service.

TABLE 1.

PERCENTAGE DISTRIBUTION OF INDUSTRIAL ESTABLISHMENTS WITH SPECIFIED STATUS OF PHYSICIAN IN CHARGE OF MEDICAL SERVICE, ACCORDING TO SIZE OF ESTABLISHMENT

Size of establishment (Number of employees)	All establishments	Status of physician in charge		
		On-call	Part-time	Full-time
	Per cent			
Total	100.0	39.0	43.0	18.0
Less than 250	100.0	75.0	25.0	.0
250-499	100.0	62.4	36.9	.7
500-999	100.0	56.2	41.3	2.5
1,000-1,499	100.0	39.2	52.3	8.5
1,500-1,999	100.0	28.4	61.4	10.2
2,000-2,999	100.0	28.8	50.9	20.3
3,000-3,999	100.0	11.3	49.1	39.6
4,000-4,999	100.0	3.7	59.3	37.0
5,000-9,999	100.0	7.1	33.8	59.1
10,000 or over	100.0	.0	9.3	90.7
	Number of establishments			
Total	962	375	414	173
Less than 250	40	30	10	0
250-499	141	88	52	1
500-999	240	135	99	6
1,000-1,499	130	51	68	11
1,500-1,999	88	25	54	9
2,000-2,999	118	34	60	24
3,000-3,999	53	6	26	21
4,000-4,999	27	1	16	10
5,000-9,999	71	5	24	42
10,000 or over	54	0	5	49

tered nurse; 64% had a full-time registered nurse only; and 30% had a full-time registered nurse and other assistance. In 27 plants other assistance was given by professional or technical persons.

One hundred seventy-three plants had one or more full-time physicians. Of these, 39% had a full-time registered nurse only, and 61% had a nurse and other assistance. One plant had a practical nurse only. As this group included most of the larger plants there was a wide variety of other medical personnel. Of the establishments which had a full-time physician 42% had only one physician, 41% had more than one full-time physician and 17% had one full-time physician and one or more part-time physicians.

Size of establishment is the most important factor in determining the number and type of medical personnel to be found in a particular establishment. According to Table 1, not a full-time physician was found in plants with less than 250 employees, and only one full-time physician was found in plants with 250 to 499 employees. The percentage of larger plants with a full-time physician was as follows: 500 to 999 employees, 2.5%; 1,000 to 1,499 employees, 8.5%; 1,500 to 1,999 employees, 10.2%; 2,000 to 2,999 employees, 20.3%; 3,000 to 4,999 employees, 38.3%; 5,000 to 9,999 employees, 59.1%; and 10,000 or over employees, 90.7%. Three-fourths of the smallest sized plants, but none of the largest plants, had an on-call physician. This type of medical care was found in 60.1% of the establishments with less than 1,000 employees, 32.7% in plants with 1,000 to 2,999 employees, and 5.9% in plants with 3,000 or over employees.

Plants having an on-call physician and no full-time registered nurse had usually less than 1,000 employees, while those with an on-call physician, a registered nurse, and a practical nurse or first-aid worker had usually from 1,000 to 3,000 employees. None of the plants with 2,000 or over employees which had a part-time physician failed to have at least a full-time registered nurse.

The number and type of medical personnel varied greatly according to industry among plants of the same broad size group. Thus establishments with less than 1,000 employees had full- or part-time physicians in 66.7% of the ordnance plants, in 61.9% of chemical plants, and in 44.4% of the non-manufacturing establishments. Only 25.0% of the textile plants and 26.7% of the lumber plants had this type of medical service.

In the group of establishments with 1,000 to 3,999 employees the per cent with part- or full-time physicians was 83.8 for chemical plants, 79.3 for food products plants and 73.1 for ordnance plants. Considering only full-time physicians, the largest per cent in medium-sized establishments was in the chemical, lumber, and transportation equipment industries. All establishments with 4,000 or over employees had full-

TABLE 2.

PERCENTAGE DISTRIBUTION OF INDUSTRIAL ESTABLISHMENTS WITH SPECIFIED TYPES OF MEDICAL SERVICE PERSONNEL, ACCORDING TO STATUS OF PHYSICIAN IN CHARGE OF MEDICAL SERVICE AND SIZE OF ESTABLISHMENT

Size of establishment (Number of employees)	On-call physician in charge				Part-time physician in charge				Full-time physician in charge			
	All establishments	With registered nurse only	With registered nurse and others[1]	With others[1]	All establishments	With registered nurse only	With registered nurse and others[1]	With others[1]	All establishments	With registered nurse only	With registered nurse and others[1]	With others[1]
	Per cent											
Total	100.0	70.1	18.4	11.5	100.0	64.3	29.6	6.1	100.0	38.7	60.7	.6
Less than 250	100.0	63.3	3.4	33.3	100.0	70.0	.0	30.0	.0	.0	.0	.0
250-499	100.0	77.3	10.2	12.5	100.0	65.4	11.5	23.1	100.0	.0	100.0	.0
500-999	100.0	73.3	17.1	9.6	100.0	76.8	18.2	5.0	100.0	33.3	66.7	.0
1,000-1,499	100.0	66.7	27.4	5.9	100.0	67.7	27.9	4.4	100.0	63.6	27.3	9.1
1,500-1,999	100.0	68.0	24.0	8.0	100.0	66.7	27.8	5.5	100.0	55.6	44.4	.0
2,000-2,999	100.0	55.9	32.3	11.8	100.0	63.3	36.7	.0	100.0	50.0	50.0	.0
3,000-3,999	100.0	83.3	16.7	.0	100.0	42.3	57.7	.0	100.0	42.9	57.1	.0
4,000-4,999	100.0	100.0	.0	.0	100.0	31.3	68.7	.0	100.0	70.0	30.0	.0
5,000-9,999	100.0	20.0	80.0	.0	100.0	41.7	58.3	.0	100.0	38.1	61.9	.0
10,000 or over	.0	.0	.0	.0	100.0	60.0	40.0	.0	100.0	18.4	81.6	.0
	Number of establishments											
Total	375	263	69	43	414	266	122	26	173	67	105	1
Less than 250	30	19	1	10	10	7	0	3	0	0	0	0
250-499	88	68	9	11	52	34	6	12	1	0	1	0
500-999	135	99	23	13	99	76	18	5	6	2	4	0
1,000-1,499	51	34	14	3	68	46	19	3	11	7	3	1
1,500-1,999	25	17	6	2	54	36	15	3	9	5	4	0
2,000-2,999	34	19	11	4	60	38	22	0	24	12	12	0
3,000-3,999	6	5	1	0	26	11	15	0	21	9	12	0
4,000-4,999	1	1	0	0	16	5	11	0	10	7	3	0
5,000-9,999	5	1	4	0	24	10	14	0	42	16	26	0
10,000 or over	0	0	0	0	5	3	2	0	49	9	40	0

[1]Includes practical nurses, full-time first-aid workers, part-time registered nurses, full-time technical and professional workers.

or part-time physicians except the food, textile, and transportation equipment industries. These differences among industries should serve as a warning against the setting of standards for industrial medical services without taking into consideration the type of processes and the shift schedules involved.

MALE NURSES. Male nurses either registered or practical were reported in 79 of the 962 establishments surveyed. They were concentrated in a few industries, notably transportation equipment, ordnance, metal products, machinery, and chemicals. Type of industry rather than size of plant appeared to influence the employment of male nurses.

OTHER PROFESSIONAL AND TECHNICAL PERSONNEL. In 117 establishments, or 12% of the total, there were other professional and technical personnel employed full time. The number of persons represented was 226, of whom two-thirds were serving in plants with 5,000 or over employees. Included under professional and technical personnel were 166 medical technicians, 35 medical students, nine dentists, seven pharmacists, six chemists, one social worker, one industrial hygienist, and one oculist. Establishments with less than 2,000 employees which had a large proportion of such persons were chemical plants and metal products plants. In establishments with 5,000 or over employees, personnel of these types were most common in plants producing ordnance and plants manufacturing transportation equipment. When medical students were employed, they were often on the night shift of medium sized plants which had a part-time physician and full-time registered nurse during the day.

Other professional and technical personnel were found in only 3.5% of the establishments with an on-call physician and 6.7% of those with a part-time physician, but they were present in 43.9% of the establishments with a full-time physician. This contrasts with the distribution of other non-professional attendants, such as practical nurses, and first-aid workers, who, for corresponding medical care groups, were found in 23.2%, 27.0%, and 27.7% of the establishments, respectively. They appear to be employed without regard to the type of medical personnel available, while professional and technical persons are definitely associated with full-time care by physicians.

RATIO OF EMPLOYEES TO MEDICAL PERSONNEL. A measure of medical service frequently used is the ratio of employees to available medical personnel. This is not entirely satisfactory, since the number of employees in any plant is constantly fluctuating, especially so at the present time when there is great industrial activity, while the number of physicians and nurses is likely to remain relatively stable. It also should be remembered that the distribution of employees by shift may influence the number of medical personnel required. For example, in two plants with the same total number of employees, one plant may work a single shift while the other may divide the working force equally into three eight-hour shifts. However, there are certain trends by size of establishment in the number of employees per individual member of the medical service personnel which are of significance. Table 3 shows that except in large establishments the number of employees for each part-time physician is much less than for each full-time physician. There is a tendency for the number of employees per part-time physician to increase with increasing size of establishment, while per full-time physician there is a tendency to decrease. Nurses in general are less affected by differences in the size of establishment. Except in establishments with less than 1,000 workers the number of employees per full-time registered nurse fluctuates from 700 to 900, reaching a maximum of 916 in the 5,000 to 9,999 group.

Other personnel of the medical department include part-time registered nurses, practical nurses, first-aid workers, and other full-time professional and technical personnel. The number of employees for each "other medical worker" gradually rose from 1,411 in the smallest establishments to 3,389 in the largest estab-

TABLE 3.

ESTIMATED NUMBER OF EMPLOYEES PER INDIVIDUAL MEMBER OF THE MEDICAL SERVICE PERSONNEL, ACCORDING TO SIZE OF ESTABLISHMENT

Size of establishment (Number of employees)	Type of medical service personnel					Estimated total number of employees
	Total	Full-time physician	Part-time physician	Full-time registered nurse	Others[1]	
	Estimated number of employees per individual member of the medical service personnel					
Total	492	5,987	4,001	793	2,809	2,496,774
Less than 1,000	267	28,386	1,234	458	1,411	227,094
1,000-1,999	427	13,335	2,145	750	2,130	306,715
2,000-2,999	520	9,496	3,318	835	3,129	275,389
3,000-3,999	534	8,129	4,471	828	3,127	178,836
4,000-4,999	541	6,781	4,269	867	3,202	115,272
5,000-9,999	578	4,916	6,339	916	3,595	481,746
10,000 or over	570	4,144	12,841	877	3,389	911,722
	Percentage distribution of members of the medical service personnel					
Total	100.0	100.0	100.0	100.0	100.0	2,496,774
Less than 1,000	16.7	1.9	29.5	15.7	18.1	227,094
1,000-1,999	14.2	5.5	22.9	13.0	16.2	306,715
2,000-2,999	10.4	6.9	13.3	10.5	9.9	275,389
3,000-3,999	6.6	5.3	6.4	6.9	6.4	178,836
4,000-4,999	4.2	4.1	4.3	4.2	4.1	115,272
5,000-9,999	16.4	23.5	12.2	16.7	15.1	481,746
10,000 or over	31.5	52.8	11.4	33.0	30.2	911,722
	Number of members of the medical service personnel					
Total	5,079	417	624	3,149	889	2,496,774
Less than 1,000	849	8	184	496	161	227,094
1,000-1,999	719	23	143	409	144	306,715
2,000-2,999	530	29	83	330	88	275,389
3,000-3,999	335	22	40	216	57	178,836
4,000-4,999	213	17	27	133	36	115,272
5,000-9,999	834	98	76	526	134	481,746
10,000 or over	1,599	220	71	1,039	269	911,722

[1]Includes practical nurses, full-time first-aid workers, part-time registered nurses, full-time technical and professional workers.

lishments. For each member of the medical staff, physicians, nurses and others, there were 492 employees. The change with size of establishment is less than for individual categories of medical personnel. This indicates that there is not so great a difference in the number of medical personnel available to care for a given number of employees as there is in who renders the service. In terms of medical care per employee the large plant has slightly less but better trained personnel. Hence a larger number of employees can be served by each individual. Plants with 5,000 or more employees account for 76% of the full-time physicians, 24% of the part-time physicians, 50% of the full-time registered nurses, and 45% of the other medical personnel. This group of establishments represents 13% of the total plants and 56% of the total workers.

According to industrial group the estimated number of employees per full-time physician in establishments with 1,000 to 3,999 workers was 2,861 for chemicals, 6,755 for lumber and paper products and 9,277 for transportation equipment. All the other industrial groups in this size range had more than 10,000 workers per full-time physician. For establishments with 4,000 or over employees the industrial groups making the best showing were ordnance, non-manufacturing, and chemicals which had 2,564, 3,002, and 4,941 employees, respectively, per full-time physician.

In establishments with less than 1,000 workers the number of employees per part-time physician ranged from 608 in ordnance plants to 2,038 in plants manufacturing transportation equipment. In establishments with 1,000 to 3,999 workers similar ratios ranged from 1,935 for non-manufacturing to 4,053 for lumber and paper products.

The number of employees per full-time registered nurse, in establishments with less than 1,000 workers varied from 297 in ordnance plants to 823 in textile plants. In the next size group (1,000 to 3,999 employees) only the chemical, ordnance, and transportation equipment industries had less than 700 employees per full-time registered nurse. In establishments with 4,000 or over employees the ordnance, machinery, and transportation equipment industries had 593, 910, and 953 employees, respectively, per full-time registered nurse. All other industries had over 1,000 employees per full-time registered nurse.

Different results are obtained if the medical personnel are compared with specific groups of the industrial population. In the following table instead of counting all workers in plants of a given size, only workers in those plants containing the particular item it is desired to compare are included. Thus the number of employees per full-time physician is calculated on the basis of employees in plants having a full-time physician.

Size of establishment (Number of employees)	Number of employees per full-time physician in establishments with a full-time physician		Number of employees per part-time physician in establishments with a part-time physician	
	1918	1942	1918	1942
500-999	678	548	768	609
1,000-1,499	1,257	982	1,213	1,121
1,500-1,999	1,854	1,672	1,645	1,499
2,000-3,999	2,893	2,497	3,067	2,122
4,000-9,999	3,083	2,922	3,338	3,291
10,000 or over	3,011	3,849	4,500	7,209

Data for 1918 calculated from, SELBY, C. D.: Studies of the Medical and Surgical Care of Industrial Workers. U. S. Public Health Bulletin No. 99. Government Printing Office, Washington, D. C., 1919.

Similar calculations were made from data gathered by Selby in 1918. Comparison of the present data with those results shows that there has been a slight decrease in the number of employees per full-time physician and per part-time physician for all plant sizes except establishments with 10,000 or over employees. In large plants, which were probably best provided with medical personnel in the earlier period, there has been an increase in the number of employees who are cared for by each physician. However, it is the uniformity rather than the difference in these data which is of interest. This suggests that for given types of medical service and plant size the physician-employee ratio has remained stable over a long period. Despite great variation in the medical service requirements of different industries there are certain broad limits within which the approximate number of medical personnel can be established.

Administrative Relations of the Medical Service

INFORMATION was obtained from 160 establishments concerning the person to whom the plant medical service was responsible. This individual was the president of the company or some other high official in 18.8% of the establishments, the general manager or superintendent in 28.7%, the personnel manager in 48.1%, and the director of safety in 4.4%. Differences in the relationship of the medical service to the company organization are noted with respect to the size of establishment. In plants with less than 1,000 employees the general manager or superintendent had authority over the medical service in 46% of the establishments, but in larger plants the personnel manager became more important and he had authority over the medical service in more than half of the establishments with 1,000 employees and over. In establishments with 4,000 employees or over, the distribution, according to department head to whom the medical service is responsible, is as follows: president or other high officers, 26.7%; general manager or superintendent, 16.7%; and personnel manager, 56.6%. Seven establishments employing from 2,000 to 3,999 persons had medical departments responsible to the safety director. These findings are not greatly different from those reported 10 years ago by the American College of Surgeons.[1] At that time it was found that the physician was responsible to a major executive in 30% of the companies with 250 or over employees, to the plant manager in 16%, and to the insurance carrier in 12% of the companies. Among the 160 companies reported in this study, those most directly engaged in war work such as the manufacture of metals, machinery, ships, and airplanes showed a larger proportion with their medical department responsible to the personnel manager than did the companies in other industries. Food manufacturing plants, and textile mills showed more than 25% with medical departments responsible to the president or other high company official.

Pre-Employment Physical Examination

DESPITE the pressure of war production schedules, pre-employment physical examinations were given in 1942 to all employees in 75.5% of the 957 establishments reporting this information. An additional 6.5% gave pre-employment physical examinations to some of their employees, whereas 18% gave no such examinations. If the companies surveyed in 1933 by the American College of Surgeons[1] are representative of plants having some medical service, then there has been an increase in the proportion of plants providing pre-employment physical examinations for all employees during the past 10 years. Comparative figures for the 1933 survey and the present survey show 44% and 70%, respectively, for establishments with less than 500 employees, 57% and 73% for establishments with 500

1. Newquist, M. N.: Medical Service in Industry and Workmen's Compensation Laws. American College of Surgeons, Chicago, 1934.

TABLE 4.

PERCENTAGE DISTRIBUTION OF INDUSTRIAL ESTABLISHMENTS GIVING PRE-EMPLOYMENT PHYSICAL EXAMINATIONS TO ALL, SOME, OR NO EMPLOYEES, ACCORDING TO STATUS OF PHYSICIAN IN CHARGE AND SIZE OF ESTABLISHMENT

Size of establishment (Number of employees)	All establishments[1]				Status of physician in charge											
					On-call				Part-time				Full-time			
	Total	Examinations given			Total	Examinations given			Total	Examinations given			Total	Examinations given		
		All	Some	None		All	Some	None		All	Some	None		All	Some	None
	Per cent															
Total	100.0	75.5	6.5	18.0	100.0	57.2	8.9	33.9	100.0	85.2	4.6	10.2	100.0	91.9	5.8	2.3
Less than 500	100.0	70.0	5.6	24.4	100.0	60.7	6.8	32.5	100.0	87.1	3.2	9.7	100.0	100.0	.0	.0
500-999	100.0	72.7	7.1	20.2	100.0	61.2	8.2	30.6	100.0	88.8	4.1	7.1	100.0	66.7	33.3	.0
1,000-1,999	100.0	73.1	5.1	21.8	100.0	52.0	8.0	40.0	100.0	82.6	4.2	13.2	100.0	95.0	.0	5.0
2,000-2,999	100.0	80.5	5.1	14.4	100.0	47.0	11.8	41.2	100.0	93.3	3.3	3.4	100.0	95.8	.0	4.2
3,000-3,999	100.0	81.1	7.5	11.4	100.0	16.7	33.3	50.0	100.0	84.6	3.9	11.5	100.0	95.2	4.8	.0
4,000-4,999	100.0	85.2	3.7	11.1	100.0	100.0	.0	.0	100.0	87.5	.0	12.5	100.0	80.0	10.0	10.0
5,000 or over	100.0	84.0	10.4	5.6	100.0	60.0	40.0	.0	100.0	62.1	17.2	20.7	100.0	92.3	6.6	1.1
	Number of establishments															
Total	957	723	62	172	372	213	33	126	412	351	19	42	173	159	10	4
Less than 500	180	126	10	44	117	71	8	38	62	54	2	6	1	1	0	0
500-999	238	173	17	48	134	82	11	41	98	87	4	7	6	4	2	0
1,000-1,999	216	158	11	47	75	39	6	30	121	100	5	16	20	19	0	1
2,000-2,999	118	95	6	17	34	16	4	14	60	56	2	2	24	23	0	1
3,000-3,999	53	43	4	6	6	1	2	3	26	22	1	3	21	20	1	0
4,000-4,999	27	23	1	3	1	1	0	0	16	14	0	2	10	8	1	1
5,000 or over	125	105	13	7	5	3	2	0	29	18	5	6	91	84	6	1

[1]Exclusive of five establishments not reporting this information.

to 1,000 employees, and 73 and 79% for establishments with 1,000 employees or over. Evidently the greatest increase in pre-employment examinations has occurred in the smaller plants, while the plants with over 1,000 employees, which had a large proportion examined in the earlier period, show relatively slight gains.

According to Table 4 the per cent of plants giving no pre-employment examination decreases with increasing size of establishment. Twenty-four per cent of the plants with less than 500 employees gave no examinations, but only 6% of the plants with 5,000 or over employees gave no examinations. Irrespective of size, the type of medical service a plant is able to maintain appears to determine whether or not a pre-employment physical examination will be given. Thus 57% of the plants with an on-call physician, 85% with a part-time physician, and 92% with a full-time physician gave such examinations to all of their employees.

It will be noted that in plants with a part-time physician in charge of the medical service, the per cent giving no physical examination is greater for the larger establishments, especially those with 5,000 or over employees. Beyond a certain size there is a limit to what the part-time physician can do, even with adequate nursing and other assistance. The reason that more of the larger establishments do give pre-employment physical examinations is that they have a greater proportion of full-time physicians. No matter what size, any plant with a full-time physician is almost certain to give physical examinations to some or all of the employees. In certain of the smaller plants which do not have complete medical service, pre-employment examinations were said to be given in the physician's office.

The survey made by the National Association of Manufacturers during 1941[2] shows that 72% of all establishments made a pre-employment physical examination of all factory workers. For specific size groups, the agreement of this report with the present study is equally close.

TYPE OF TESTS. A total of 137 establishments, giving pre-employment physical examinations to all applicants for work, reported on certain tests performed. Listed in order of importance the per cent of establishments giving these tests was as follows: blood pressure, 91%; tests of vision, 85%; urinalyses, 63%; blood tests for syphilis, 50%; exercise tests, 30%; chest x-rays, 15%; and blood examinations (red cell count, hemoglobin determination, or basophilic aggregation), 12%.

Variation in the per cent of establishments giving particular tests was less marked according to number of employees than according to type of medical personnel. As the size of establishment increased there was not always an increase in the per cent of establishments giving a certain test. Thus, establishments with 4,000 or over employees had a smaller per cent of the following tests than establishments with less than 500 employees: urinalyses, blood tests for syphilis, exercise tests, chest x-rays, and blood pressure readings. In this instance, a small plant makes a better showing than a large one.

Disregarding size of establishment, there are considerable differences in the proportion of tests given according to type of medical personnel. For establishments with on-call, part-time, or full-time physicians, the percentages giving visual tests were 72, 86, and 94, respectively. Corresponding figures for chest x-rays were 8, 14, and 21%; for blood tests for syphilis, 48, 44, and 67%; for urinalyses, 52, 66, and 67%; and for blood examinations, 4, 10, and 21%. Blood pressure was measured and exercise tests were given in about the same proportion of establishments, no matter what type of medical personnel was available.

LENGTH OF EXAMINATION. The average number of minutes per pre-employment physical examination was 22 for the 125 establishments which gave this information. The most frequent time interval was 15 to 19 minutes, representing 26% of all establishments, followed by intervals of 20 to 24 minutes and 30 to 34 minutes, respectively, each representing 18% of all establishments.

No examinations lasted less than five minutes or more than 60 minutes. Indeed, only 6% lasted more than 35 minutes. While 38% of the establishments with a full-time physician had physical examinations requiring more than 25 minutes, only 29% of the examinations in establishments with a part-time physician lasted this long.

2. National Association of Manufacturers: Industrial Health Practices—A Report of a Survey of 2,064 Industrial Establishments. National Association of Manufacturers, New York, 1941.

TABLE 5.

NUMBER OF INDUSTRIAL ESTABLISHMENTS REPORTING THE SPECIFIED NUMBER OF ROOMS IN THE MAIN DISPENSARY, ACCORDING TO SIZE OF ESTABLISHMENT

Size of establishment (Number of employees)	Establishments reporting number of rooms	Establishments with specified number of rooms										Average number of rooms per establishment	Number of rooms per 1,000 employees
		1	2	3	4	5	6	7	8	9	10 or more		
Total	170	48	11	28	24	22	14	5	7	5	6	4.2	1.4
Less than 250	7	5	1	0	1	0	0	0	0	0	0	1.6	9.3
250-499	22	11	5	0	3	2	0	1	0	0	0	2.3	6.2
500-999	34	19	2	7	5	1	0	0	0	0	0	2.0	2.8
1,000-1,499	26	8	1	5	7	2	2	0	1	0	0	3.2	2.6
1,500-1,999	11	3	0	2	2	1	2	0	1	0	0	3.8	2.3
2,000-2,999	22	2	2	7	1	4	3	1	1	1	0	4.2	1.7
3,000-3,999	16	0	0	5	1	3	1	1	0	3	2	6.0	1.8
4,000-4,999	10	0	0	1	1	4	2	1	1	0	0	5.4	1.2
5,000-9,999	12	0	0	1	2	5	2	0	0	1	1	5.7	.9
10,000 or over	10	0	0	0	1[r]	0	2	1	3	0	3	15.1	.7

The Dispensary

SIZE. One measure of the adequacy of industrial medical service is the number of rooms in the main dispensary. While the smaller plants are in general limited to one room, as the size of the establishment increases it soon becomes possible to have three rooms, consisting of a waiting room, a treatment room, and a room for consultation or physical examinations. Data from 170 establishments give some indication of the number of rooms which are practical for plants of a certain size. These are not ideal specifications, but represent facilities being operated during 1942 under wartime conditions. According to Table 5 only two of the seven establishments with less than 250 employees had more than a one-room dispensary, but nearly half of the establishments with 250 to 999 employees had dispensaries with two, three, four, or five rooms. In the latter group, the smaller establishments generally had two rooms while the larger establishments had three or four rooms.

Two-thirds of the establishments employing 1,000 to 1,999 persons had dispensaries with three or more rooms, ranging to as high as eight rooms. Four-fifths of the establishments with 2,000 to 2,999 employees had three or more rooms. No establishment with 3,000 or more employees had either a one-room or two-room dispensary; all had a larger number of rooms. Dispensaries with five or more rooms became common in the group with 4,000 to 9,999 employees. Establishments with 10,000 or more employees had, in all but one instance, six or more dispensary rooms. In the largest plants a count of the rooms in the main dispensary frequently does not show the full extent of medical facilities since there are likely to be substations or first-aid posts in various locations throughout the area of operations. In terms of the number of dispensary rooms per 1,000 employees, there is a decrease as the size of the establishment increases. Thus, in establishments with less than 500 employees, the number of rooms was 6.6 per 1,000; for those with 500 to 1,499 it was 2.7 per 1,000; and for those with 1,500 to 4,999 it was 1.7 per 1,000; while for those employing 5,000 persons and over the number of rooms was 0.8 per 1,000 employees.

The number and type of medical personnel in any establishment and the number of dispensary rooms available are closely related. Thus, no plants with a one-room dispensary, and only 2.5% of those with two or three rooms, had a full-time physician. One-fourth of the plants with four or five rooms, and half of the plants with six or more rooms, had a full-time physician. In establishments with only one room, 56% had an on-call physician with a full-time registered nurse and 29% had a part-time physician and a registered nurse. Seventy-two per cent of the dispensaries with two or three rooms had a part-time physician and a full-time registered nurse. Eighty-five per cent of the dispensaries with four or five rooms had a full-time or a part-time physician with a full-time registered nurse. Apparently many plants which provide only a one-room dispensary expect to depend on a full-time nurse without any regular attendance of a physician at the plant. A two- or three-room dispensary has frequently a part-time physician, while a dispensary with four or more rooms is almost sure to have either a full-time physician or a part-time physician.

Ninety-five establishments reported the number of square feet of space in their dispensary. This allows the calculation of the average number of square feet per employee which, according to size of establishment, was as follows: Less than 500 employees, 1.00 square feet; 500 to 999 employees, 0.65 square feet, 1,000 to 1,999 employees, 0.60 square feet; 2,000 to 2,999 employees, 0.56 square feet; 3,000 to 3,999 employees, 0.47 square feet; and 4,000 or more employees, 0.44 square feet per employee. It will be observed that as the size of the establishment increases the amount of dispensary space per employee decreases, so that in the large plant less than half as much space is allotted as in the small plant.

TYPE OF ROOMS. It is of interest to note the types of dispensary rooms found in plant dispensaries of certain sizes. Thus, waiting rooms were found in 18% of the plants with two-room dispensaries, but were found in more than three-fourths of the plants with larger dispensaries. When a third room was added it was usually a waiting room or a consultation room. Special rooms for disrobing were generally not provided until the dispensary had four or more rooms. Even in plants with six-room dispensaries only 43% reported disrobing rooms. A room used for a laboratory was found in 13% of the plants with four-room dispensaries, 59% of those with five-room dispensaries, and 86% of those with six-room dispensaries. A bed or cot, not necessarily in a separate room, was found in 86% of all dispensaries with two to six rooms, inclusive. The presence of a bed or cot was little affected by the number of rooms.

As an indication of the changes which have taken place in plant dispensaries during the past 24 years it is possible to compare the present study with data secured in 1918 by Selby.[3] In the former 29.5% and, in the latter, 14.6% of the plant dispensaries included a separate laboratory room. Corresponding percentages for plants of specified sizes were as follows: Less than 1,000 employees 6.4 and 3.0; 1,000 to 1,999 employees 27.0 and 5.6; 2,000 to 3,999 employees 39.5 and 12.5; 4,000 or more employees 71.4 and 31.8. Evidently the increased provision of laboratories has been uniform

3. Selby, C. D.: Studies of the Medical and Surgical Care of Industrial Workers. U. S. Public Health Bulletin No. 99. Government Printing Office, Washington, D. C., 1919.

TABLE 6.

PER CENT OF INDUSTRIAL ESTABLISHMENTS REPORTING DISPENSARIES CONTAINING THE SPECIFIED EQUIPMENT, ACCORDING TO BROAD SIZE GROUP

Size of establishment (Number of employees)	Establishments reporting one or more items of equipment	Equipment														
		Adequate light	Sterilizer	Case of instruments	Examining table	Suture materials	Scales	Sphygmomanometer	Eye spuds	Eye dressings	Heat lamps	Ophthalmoscope	Corneal loupe	Diathermy	X-ray	Electrocardiograph
	Per cent															
Total	100.0	98.1	88.1	87.5	75.6	75.0	68.8	64.4	53.1	52.5	46.3	35.6	34.4	24.4	19.4	3.8
Less than 1,000	100.0	96.7	78.3	80.0	60.0	60.0	50.0	41.7	45.0	40.0	30.0	15.0	26.7	8.3	3.3	3.3
1,000-2,999	100.0	100.0	94.2	86.5	76.9	80.8	75.0	67.3	51.9	57.7	36.5	36.5	28.8	11.5	7.7	.0
3,000 or over	100.0	97.9	93.7	97.9	93.7	87.5	85.4	89.6	64.6	62.5	77.1	60.4	50.0	58.3	52.1	8.3
	Number of establishments															
Total	160	157	141	140	121	120	110	103	85	84	74	57	55	39	31	6
Less than 1,000	60	58	47	48	36	36	30	25	27	24	18	9	16	5	2	2
1,000-2,999	52	52	49	45	40	42	39	35	27	30	19	19	15	6	4	0
3,000 or over	48	47	45	47	45	42	41	43	31	30	37	29	24	28	25	4

throughout the entire size range of industrial establishments.

There has been very little change with time in the percentage of dispensaries including waiting rooms. Fifty-nine per cent of the dispensaries in 1918 and 58% in the present study had waiting rooms. Establishments with less than 2,000 employees made a slightly better showing in 1918 than at present. Plants with greater than this number of employees made a better showing in the current study.

EQUIPMENT IN THE DISPENSARY. Information was obtained regarding the equipment found in the dispensary of 160 establishments. The percentage of establishments reporting certain items (shown in Table 6) was as follows: Adequate light, 98%; sterilizer, 88%; case of instruments, 88%; examining table, 76%; suture materials, 75%; scales, 69%; sphygmomanometer, 64%; eye spuds, 52%; eye dressings, 53%; heat lamps, 46%; ophthalmoscope, 36%; corneal loupe, 34%; diathermy apparatus, 24%; x-ray unit, 19%; and electrocardiograph, 4%.

When establishments with less than 1,000 workers are compared with establishments with 3,000 or more workers, certain equipment is found very much more frequently in the latter group. For example, a rise from 3 to 52% was observed for x-ray, 8 to 58% for diathermy apparatus, and 15 to 60% for ophthalmoscope. On the other hand, certain equipment, such as case of instruments, examining table, and sterilizer, was common in establishments of all sizes. A decided increase in the percentage of establishments having scales and suture material was observed when establishments with less than 1,000 employees were compared with the next larger size group.

Workmen's Compensation and Sick Benefits

WORKMEN'S COMPENSATION. Some form of workmen's compensation was in effect in all the states in which the plants were located. The main objective of compensation is the payment of benefits to injured employees or to the dependents of those killed in industry, without regard to the question of negligence. The method of providing the necessary funds varies greatly and is determined partly by choice of the individual company and partly by state laws. Some states have a state insurance system and in a few of these all employers who are covered must insure in the state fund. In the majority of states the employer is allowed to insure in private insurance companies or to self-insure, if he can satisfy the compensation board that he is financially able to cover his risks.

In the 920 establishments providing information relative to workmen's compensation 61% insured with a private company, 27% were self-insurers, and 12% were covered by a state fund. Size of establishment influenced the type of insurance. Of the establishments with less than 1,000 employees 19% were self-insurers, 71% insured in private companies, and 10% were under state funds. In establishments with 3,000 or over employees the corresponding percentages were 48, 38, and 14. It will be seen that the chief difference is that the more stable financial condition of the larger companies permits a larger proportion of them to carry their own insurance.

SICK BENEFITS. Workers who are absent on account of sickness are provided with some form of sick benefits (usually a certain percentage of the regular wages) in 78% of the establishments studied. Contrary to the findings for most types of industrial medical service there was little difference according to size of establishment in the per cent of plants with sick benefit organizations. The smallest establishments, those with less than 500 employees, had a slightly smaller per cent with sick benefit organizations than the average for all plants. The highest per cent (86) was found in establishments with 10,000 or more employees.

According to industry there was considerable difference in the per cent of establishments with sick benefits. At the top were non-manufacturing establishments with 86%, chemicals with 85%, and lumber and paper products with 83%. Food and tobacco products with 72% and textiles with 59% had the lowest percentages of sick benefit organizations. From the above it will be noted that, in general, those industries which have the most adequate supply of physicians, nurses, and medical technicians are likely to be most active in the providing of benefits for sick employees. The good showing made by non-manufacturing industries suggests that the provision of more adequate industrial medical care is not entirely due to the hazardous nature of the work performed.

Under most sick benefit plans there is a waiting period between the onset of illness and the time when the payment of benefits is begun. The proportion of the total employees who actually receive benefits is determined largely by the length of the waiting period. Since the majority of absences due to sickness last less than a week, only those plans which provide for payments within the first few days after onset will aid a substantial percentage of the employees.

Considering all establishments it was found that the waiting period for sick benefits was longer than a week in 7.7%, exactly seven days in 60.4%, four through six days in 4.9%, one through three days in 21.4%, and no waiting period in 5.6%.[4] Size of establishment apparently had little influence on length of waiting period. The most noticeable difference was the

4. See Division of Industrial Hygiene, National Institute of Health: Manual of Industrial Hygiene and Medical Service in War Industries. W. B. Saunders Company, Philadelphia, 1943. Pp. 423-424.

TABLE 7.

PER CENT OF INDUSTRIAL ESTABLISHMENTS WITH A CAFETERIA[1] SERVING ALL EMPLOYEES, ACCORDING TO INDUSTRY AND BROAD SIZE GROUP

Size of establishment (Number of employees)	All establishments[2]	Industry									
		Chemicals	Food products and tobacco	Non-manufacturing	Transportation equipment	Ordnance	Machinery	Miscellaneous manufacturing	Lumber and paper products	Metal products	Textiles
	Per cent of establishments with cafeteria										
Total	51.6	72.3	70.4	67.6	62.6	60.5	45.3	44.4	37.9	33.5	32.9
Less than 1,000	39.3	65.9	59.2	47.2	33.3	30.4	34.8	28.0	31.8	28.4	32.1
1,000-3,999	55.4	78.4	89.3	89.7	50.9	50.0	50.7	63.2	50.0	36.5	31.9
4,000 or over	75.5	75.0	75.0	100.0	92.7	86.5	64.7	100.0	.0	45.5	40.0
	Total number of industrial establishments										
Total	954	94	81	68	115	86	159	45	66	155	85
Less than 1,000	417	41	49	36	21	23	69	25	44	81	28
1,000-3,999	386	37	28	29	53	26	73	19	22	52	47
4,000 or over	151	16	4	3	41	37	17	1	0	22	10

[1] Includes restaurants.
[2] Exclusive of 8 establishments not reporting this information.

large proportion of non-manufacturing establishments (65%) which had a waiting period of less than seven days. No other industries had as much as 37% of the establishments with a waiting period this short.

Food Service

CAFETERIAS, which term includes restaurants, were reported in 51.6% of 954 establishments. Thirty-five per cent of the smallest plants, those with less than 250 employees, provided cafeterias. The same percentage of establishments having 250 to 499 employees offered this service. With increase in size, a larger proportion of the establishments offered cafeteria service. The per cent with cafeterias were as follows: 500 to 999 employees, 43%; 1,000 to 3,999 employees, 55%; 4,000 to 9,999 employees, 67%; and 10,000 or over employees, 91%. Findings of the study by the National Association of Manufacturers[2] were quite similar.

Table 7 shows that the per cent of establishments with less than 1,000 employees having cafeterias varied greatly according to industry. The chemical industry stood at the top with 66%, followed by food and tobacco with 59%, and non-manufacturing with 47%. Less than 32% of the plants in each of the following industries had cafeterias: lumber and paper products, ordnance, and metal products.

In establishments with 1,000 to 3,999 employees the per cent with cafeterias was 90 for non-manufacturing, 89 for food and tobacco, and 78 for chemicals. These are the same industries, but in different order, that were best provided with cafeterias in plants with less than 1,000 employees. Textiles and metal products had the smallest per cent with cafeterias.

The group of establishments with 4,000 or over employees showed three-fourths or more with cafeterias except for the textile, metal products, and machinery industries.

Information regarding food dispensers was obtained from 171 establishments. The type of service provided was divided into three groups, namely, milk only or in combination with sandwiches, candy or soft drinks; sandwiches only or in combination with candy or soft drinks but no milk; and candy or soft drinks without either milk or sandwiches. It was found that 77% of the plants with cafeterias had, in addition, food dispensers, compared with 68% of the plants without cafeterias which had food dispensers. Of the former group 27% provided candy or soft drinks, 8% sandwiches, and 65% milk, while for the latter group the corresponding percentages were 45, 13, and 42, respectively. Although a slightly larger proportion of the non-cafeteria plants provided sandwiches, a decidedly smaller proportion provided milk. Thus it would appear that plants offering a regular food service are also more likely to have milk available at other times and at other places throughout the plant.

Conclusion

A GROUP of industrial establishments having some type of medical service were studied during 1942. Although great variation was found in the extent of medical service available in the different plants certain trends were evident. As the size of establishment increased the per cent of plants with an on-call physician decreased while part-time physicians assumed greater importance. Only in establishments with 3,000 or more employees were full-time physicians found in appreciable numbers. When the total medical staff including physicians, registered nurses, practical nurses, first-aid workers, and other professional and technical personnel was related to the number of employees it was found that there was not a great difference according to size of plant. The larger plants had slightly less in number but better trained medical personnel per employee.

The percentage of plants which gave pre-employment physical examinations to all employees appears to depend less on size than on the type of medical personnel available. With a full-time physician in charge such examinations were almost certain to be given. In terms of the number of rooms and the number of cubic feet per employee in the dispensary there was a sharp drop as the size of the establishment increased. This indicates that the larger plants are in a favorable position with regard to the provision of adequate equipment in the medical department. The frequency with which sick benefit associations were operated corresponded closely with the extent of other medical services. Food service in the form of restaurants or cafeterias was available in one-third of the smaller plants and three-fourths of those with 4,000 employees or over.

No matter what the size of establishment, certain industries were found to provide more complete medical service in terms of the various items reported. Notable among these were ordnance and chemical manufacturing plants, which are distinctly war industries.

ACKNOWLEDGMENTS: The Industrial Nursing Survey was conducted jointly by the Committee to Study the Duties of Nurses in Industry of the Public Health Nursing Section, American Public Health Association, and the Division of Industrial Hygiene, National Institute of Health. The survey was begun in March, 1942, and continued through December, 1942. The data were collected

through personal interviews with the plant nurse or other plant official by consultant nurses in the state divisions of industrial hygiene, by staff nurses in state departments of public health nursing, and by committee members. Grateful acknowledgment is made to these nurses and to other individuals for their participation in the survey.

DR. W. J. MCCONNELL, now Lieutenant Colonel, Medical Corps, supervised the initial medical surveys. The authors also wish to acknowledge the assistance given by the staffs of the various state industrial hygiene divisions and the assistance of certain members of the staff of the Division of Industrial Hygiene, National Institute of Health.

Further reports based on these surveys are planned for future publication.

The Mind of the Injured Man

Book Review by
LYDIA G. GIBERSON, M.D.

THE MIND OF THE INJURED MAN, by JOSEPH L. FETTERMAN, M.D., Assistant Clinical Professor of Nervous Diseases, Western Reserve University, Cleveland. Published by Industrial Medicine Book Company, 605 North Michigan Ave., Chicago. Cloth; 6x9; 260 pp., bibliography; index. Price $4.00.

DR. FETTERMAN has made a compact, lucid and distinctly significant contribution to the literature of industrial medicine. By admirable editing, he has succeeded in compressing between its covers a reference work of real merit.

However, from my viewpoint the most outstanding achievement of the book is that, by the clarity and simplicity of its definitions, the author has gone a long way toward clearing up the confusion of terminology which has surrounded neurology and psychiatry in the lay mind and often, surprisingly enough, the industrial physician. That psychiatrists and neurologists have in large measure been responsible for this confusion, is beside the point. The book, in my opinion is definitely a *must* in the reference group of an industrial physician, on whom an increasing neuropsychiatric burden is being laid in these times of war stress. It can save him many a moment of uncertainty.

I would, however, add this one note of caution. The book has so successfully achieved its author's avowed aim of simplicity, that the enthusiastic personnel man or executive might gain through reading it, "A little knowledge is a dangerous thing" attitude. He can avoid this error, however, by a careful reading of DR. FETTERMAN'S own introductory material.

Fracture Treatment

Book Review by
FREDERICK W. SLOBE, M.D.

PICTORIAL HANDBOOK OF FRACTURE TREATMENT, by EDWARD L. COMPERE and SAM W. BANKS; 351 pages; published by The Year Book Publishers, Inc., Chicago.

AS STATED by the authors, this book was prepared because other small texts have "failed to provide the mental or visual picture of the actual steps required." It was written chiefly for general practitioners, younger physicians, and medical students. And, due to the limited size of the book, usually only one method for treating each fracture is shown.

The introductory chapters, adequate in proportion to their brevity, discuss general considerations of treatment, pathology, fracture healing, diagnosis, emergency care, anesthesia, cast applications, and after care.

The important subject of compound fractures is covered very adequately, though in semi-outline form. The same applies to the material on delayed union and non-union and the section on bone atrophy. Aseptic bone necrosis, a subject apparently of unusual interest to the authors, is presented with considerable excellent detail.

Over two-thirds of the book is devoted to the methods of handling individual fractures. The method or methods selected constitute, for the most part, generally accepted procedures. Many of these methods will be new to some physicians affording them profitable reading. A few of the methods would not be selected by certain fracture specialists as the preferred procedure; this is to be expected in any field of surgery where alternate methods are available.

One of the most valuable features of this book is the numerous drawings clearly depicting the fractures and the actual steps in reduction and treatment. The reader is thus given a visual perception of what the authors are trying to convey.

Where indicated, operative procedures are adequately illustrated. Skeletal traction and fixation are used freely. The Roger Anderson equipment, though described in a few instances, is not featured, doubtless due to the fact that it is a rather specialized and highly technical method.

Without being critical, a few amplifications and suggestions may be offered. In discussing shock, the time-honored practice of applying external heat is recommended without mentioning the newer concept which holds that warmth be utilized with great discrimination and perhaps confined to keeping the patient comfortable in relationship to his environment. The illustrations depicting the pin sites for skeletal traction or fixation are not very precise and fail to show the exact distance from anatomical landmarks where they should be inserted. In the section on compound fractures where morphine is advised except when complicated by a head injury, the contra-indications might have been extended to include instances of suspected intra-abdominal injury and possibly also instances where shock is unusually severe.

In the discussion on acute bone atrophy (post-traumatic dystrophy) and causalgia, the rather startling and surprising statement is made that "the responsibility for occurrence of this condition rests, as a rule, with the surgeon." Actually, these conditions occur so frequently without demonstrable cause and their mechanism is so little understood that it seems unfair to incriminate the surgeon. Medicolegal implications of such an assertion are not difficult to visualize. The authors infer that causalgias following wrist fractures usually result from shoulder involvement; while this undoubtedly is a factor, most investigators probably feel that local disturbances in the wrist or forearm are more frequently the initiating mechanism. The authors' reaction is not difficult to understand, however, in their zeal to emphasize the very great importance of early active use of muscles and joints in minimizing stiffness, atrophy, and trophic disturbances. Ill-advised passive motion of stiff joints is decried.

For metatarsal fractures, no mention is made of the simplest and best method for most cases: early ambulation using only a bar attached transversely across the sole of the shoe a few inches distal to the heel as described by Gebhard. Nor is the simple and effective Lewin splint for "baseball" finger mentioned.

This book condenses a tremendous amount of most valuable information in small size. It graphically portrays what happens when bones break and what to do about it. It has many unique and valuable features not found in large texts. It furnishes a means of ready and authoritative reference. It is valuable not only for general practitioners and young physicians for whom the authors modestly state the book was designed, but for the experienced surgeon as well.

Industrial Medicine

Book Review by
C. O. SAPPINGTON, M.D., Dr.P.H.

PRINCIPLES AND PRACTICE OF INDUSTRIAL MEDICINE. Edited by FRED J. WAMPLER, M.D., with 32 contributors. Foreword by T. LYLE HAZLETT, M.D. 579 pages plus xiv. The Williams & Wilkins Company, Baltimore, Maryland, 1943. Price $6.00.

THIS VOLUME is the most recent of a number which have appeared on similar subjects within the past few months. Although adaptation of material to teaching has been slow, it may now be said that the teaching of industrial health, industrial hygiene and industrial medicine in medical schools, nursing schools, including safety, personnel administration and others, is certainly far behind the availability of printed material. The last three books which have appeared in this field may well be used as texts,

reference books and guides, because they all contain material somewhat different although alike in certain respects. As our old friend, Don Cummings, says in Chapter III on Industrial Accidents: "Since this subject, like politics, suffers from too much discussion and too little beneficial action, the author will attempt to be both succinct and constructive." It seems rational to conclude that "the tage of much talk" has passed and hat now is the time for the wide use of teaching material.

The title of the book "The Principles and Practice of Industrial Medicine" could be misleading, as some students and general practitioners might expect the same sort of material as applied to industrial medicine, that Osler so well wrote in his "Principles and Practice of Medicine." However, the material in the present book has not been organized on such a clinical basis, and this might not be expected because of certain differences between pure clinical medicine and applied industrial medicine. Such treatment as Osler gave the subject of medicine would require volumes if applied to industrial medicine.

The chapters include discussions of the history of industrial medicine; methods employed in the appraisal and control of industrial hazards; industrial accidents; medical service in industry; medical department layout; governmental agencies; industrial health program of the A.M.A.; and certain important problems, such as light, fatigue, tuberculosis, venereal disease control; nutrition, compensation, rehabilitation, small plant services; eye injuries, and women in industry. Other material includes the effect of certain exposures, such as temperature and humidity, abnormal atmospheric pressures, substances causing occupational poisoning, organic solvents, gases, electricity, traumatic shock and burns, and the like. Administrative subjects include physical examinations, the nurse in industry, and general industrial medical practices.

The chapters vary considerably as to length and as to authorship, as might be expected: the chapter on Industrial Medical Services for Small Plants, for example, contains four and a half pages, while the chapter on Industrial Lead Exposure and Lead Poisoning occupies 38 pages (there are 33 chapters in all); there are some examples of where the same author has written several chapters, and of two authors writing the same chapter —in one instance four authors have contributed a single chapter. There is a fair unity of style, somewhat unexpected in multiple authorship treatment; however, one gets the impression of didactic and academic methods of presentation, particularly with regard to mode of expression, which may have been purposeful, but which is not readily understood by those whose knowledge is elementary or entirely lacking, as with the student and the general practitioner.

Emphasis has been placed on scientific discovery and its application to industrial medicine in the foreword, and it has been previously stressed many times that prevention is the keystone of industrial medical practice. There is little material concerning the demonstration of methods and practices to determine the etiology of occupational diseases and other industrial affections, such as one might wish to see; the student and the general practitioner certainly need to know that there are various instruments of precision and methods of analysis by which the kind and intensities of industrial exposures may be determined. This seems important, although the physician himself may never use such methods—but, since he is given the responsibility for appraising the toxicological possibilities, he certainly must know about them.

Well prepared graphs and line drawings are used to good purpose in some of the chapters, although photographic illustrations are few, these being restricted to microphotographs and x-ray reproductions in the chapter on Pneumoconiosis. X-ray photographs of the chest are sometimes very difficult to reproduce so that they will show what is intended—that apparently was a problem here.

A list of references is shown at the end of most chapters, the most excellent of these being at the end of the chapter on industrial lead exposure and lead poisoning, and the 74 references at the end of the chapter on occupational diseases of the skin.

DR. WAMPLER gives well-earned credit to several organizations which have been pre-eminent in the field: "Foremost in this group promoting industrial health have been the National Safety Council, the American Association of Industrial Physicians and Surgeons, and the American Industrial Hygiene Association. These last two groups carried the banner for industrial health when many doubters and opposers stood on the sidelines. The high standards of industrial medicine and hygiene were made possible by the character and professional strength of the men making up these two organizations."

There are many difficulties which are always evident when writing a book—these difficulties increase with multiple authorship, in the attempt to converge the viewpoints of different persons. That DR. WAMPLER has succeeded admirably as editor is evident by an inspection of the volume.

There still remains a great deal of confusion in the minds of many physicians, including those who are teaching, as to the differences between industrial health, industrial medicine, and industrial hygiene, although these differences have been well delineated by an outline previously published by the A.M.A. Council on Industrial Health, for teaching purposes. Because of these differences and the variety of material in recent books in this field, as previously pointed out, the present volume, together with others, will be valuable in teaching, as reference guides and textbooks, to give an over-all picture of the numerous ramifications in this type of preventive medicine and public health practice. Last, but not least, didactic instruction and theory must certainly be supplemented by demonstration of cases of occupational disease, the use of industrial hygiene data, and by plant visits and inspections, so that etiology may be observed first-hand. Physicians and surgeons on hospital staffs throughout the country make what are known as ward walks—the modern industrial physician and surgeon must make plant walks.

In-Plant Hygiene Training

UNIVERSITY OF MICHIGAN School of Public Health, Ann Arbor, will conduct, on October 19, 20, and 21, a short "Continued Education Course" in Industrial Hygiene for plant safety personnel. This course will be conducted at the request of the MICHIGAN INDUSTRIAL HYGIENE ASSOCIATION. It was requested because of the increasing necessity for safety personnel to assist and cooperate with industrial hygiene agencies, brought about by the vastly expanding war industries and the inadequate industrial hygiene supervisory personnel. It is designed specifically to serve personnel responsible for plant safety, engaged either full or part time in this activity. The special faculty for the course is composed of outstanding specialists in the topics presented, and individuals in official and private industrial hygiene organizations in Michigan.

Seating

SEATING is particularly important for women. Continuous standing may aggravate menstrual troubles, and under no circumstances should it be required of pregnant women. Further, because of their tendency to suffer from varicose veins, standing is harmful for women. In the recent medical study of 536 New York department-store employees over 40 years of age who had been at least 10 years at this work, women who stood or walked showed a higher incidence of varicose veins than those who sat at their work, a condition not found among men. Moreover, there was a decided difference between the men and the women in the incidence of varicose veins. The difference was by no means due solely to pregnancy, as is clear from the following:

	Percentage with varicose veins
Men	40.7
Women	73.2
Never pregnant	66.9
One or more pregnancies	79.5

The physicians who made this study attribute the difference, at least in part, to the "noticeable difference in the firmness of the surrounding tissues supporting the venous back pressure." The part played by high heels and inactivity of leg muscles has not been explored.

—From "Women's Effective War Work Requires Good Posture," by MARGARET T. METTERT, in Special Bulletin No. 10, of the Women's Bureau of the U. S. Department of Labor.

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All But Settled!

ONE of the alleged interferences with maximum wartime production is all but disposed of—we're told that "Uncle Sam is rolling up his sleeves to tackle the knotty problem of industrial absenteeism" (p. 25). That does it, of course! There are no details as to whether the remedy is going to be roll back, subsidy, rationing, or OPA investigators. But there is no need to worry about the how; the fledgling lawyers of the "Absenteeism Bureau" will think up something with which to "hold the ((assembly) line." Meanwhile, here is a *real* thought from an editorial in *Chicago Daily News*: "If the government really wants to cut down absenteeism let it study the effect of governmental controls on the daily lives of the workers and devise means of lessening the strain on time and energy that they entail." This would be helpful, but it is too simple and direct. Another, and equally constructive, invitation to thought is offered by the Aluminum Company of America's Cleveland plants, which have enlisted the help of the employees: "Chronic truants will be interviewed by a union committee in private offices provided by the Alcoa management; every new employee will be interviewed by co-workers, who will explain policies, practices and lines of promotion, and union representatives will visit homes of employees absent without explanation." That, however, seems also too simple!

The Carbon Tetrachloride M.A.C.

THE problems involved in establishing a maximum allowable concentration for carbon tetrachloride afford an excellent illustration of the difficulties that may be expected as more and more industrial hygiene data are accumulated. The trend toward the acceptance of lower values is not dependent solely on the more recent demonstration of physical injury, but is in great part an expression of the general improvement of the working environment, with the gradual elimination of conditions which, although not likely to cause real physical injury, are generally recognized as "uncomfortable." Carbon tetrachloride combines the properties of good solvent power and non-inflammability with an appreciable toxicity, and because of its wide applications in industry has merited a considerable study. The initial suggested maximum permissible limits for continuous exposure of 1000 parts per million or more were not based on satisfactory clinical study. Davis[1] in 1934 and Smyth[2] in 1936 both suggested the value of 100 p.p.m., and this figure has been repeated in most of the industrial hygiene references until it has acquired rather general acceptance.

In 1941 Heimann,[3] reporting a small series of cases presenting symptoms following exposures to average concentrations of about 80 p.p.m., stated that "the concentration . . . should be kept below the 100 p.p.m. at present accepted as a permissible concentration." Further doubt as to the validity of the value was raised by the publication of Elkins[4] in 1942 in which he suggested that "the correct value is not above 50 p.p.m. and probably not below 25 p.p.m." More recently Bowditch[5] and Byers[6] have urged the downward revision of the M.A.C. of 100 p.p.m.

This conflict with the earlier opinion emphasizes the need for defining the criteria which are to be accepted in setting these standards. There is no absolute line of demarkation at which there is likely to be complete agreement. The majority of authoritative opinion would agree that the level should be below that associated with definite pathologic changes in the individuals exposed, but there might be justifiable criticism of setting it so low as to prevent any and all symptomatic effects if the requirements for attaining this level were extremely difficult, impractical, or economically unsound.

The more recent arguments for requiring a lower M.A.C. are based chiefly on the history of nausea, vomiting, and headache. Carbon tetrachloride is one of the substances particularly likely to provoke these symptoms, especially in individuals who have never been exposed to solvents, or who have at one time actually been made sick by a considerable exposure. In some instances nausea, vomiting and headache have been occasioned by an exposure so slight and of such short duration that it obviously is due to psychogenic factors. Frequently workmen who develop nausea on the initial exposures to carbon tetrachloride experience no discomfort to these same concentrations after a longer contact. On the other hand, repeated nausea and vomiting, loss of appetite, and headache, even though due to psychogenic factors cannot be disregarded. The severity of the individual cases, the proportion of the workmen involved, the difficulties in selecting a resistant group of workmen, and the practical problems inherent in controlling the environmental factors must be integrated to secure the best possible answer. This conflict of opinion does not deprecate the concept of defining safely respirable concentrations; rather it is an indication that for one substance at least, we are approaching a more accurate and safer standard. —James H. Sterner, M.D.

1. Davis, P. A.: *J.A.M.A.*, 103:962, 1934.
2. Smyth, H. F., Jr., and Carpenter, C. F.: *J. Indust. Hyg. & Tox.*, 18:277, 1936.
3. Heimann, H., and Ford, C. A.: *New York State Industrial Bulletin*, 20, July-August, 1941.
4. Elkins, H. B.: *J. Indust. Hyg. & Tox.*, 24:233, 1942.
5. Bowditch, M.: *Industrial Medicine*, 12:440, July, 1943.
6. Byers, D. H.: *Industrial Medicine*, 12:440, July, 1943.

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Industrial Hazards and Their Prevention

—A Survey Based on 3600 Accidents—

JOSEPH J. TOLAND, JR., M.D., F.A.C.S.,
and
IGHO KORNBLUEH, M.D.,
Philadelphia

THE cooperation of the medical, engineering and chemical services only is the basis for a successful campaign for the prevention of industrial accidents. A clear division of the tasks and duties of the medical and engineering groups is very difficult, even with Bloomfield's[1] definition that "the functions coming within the province of the medical department are concerned with the individual, while the functions with which the engineer concerns himself deal with the environment."

The causes of accidents are not confined to tools, machines, and working environment only, but are often the consequence of manifold complicated psycho-physical personal deficiencies and are also greatly dependent on uncontrolled external influences. In accordance with Bloomfield's statement, it is the duty of the medical service to determine the existence of such conditions, and the task of the engineering department is to eliminate the cause, provided that technical and not individual deficiencies are the cause.

Applied industrial medicine, especially its preventive part, is a relatively new science. Thirty-six years ago little was known or being done about it. According to Ridinger[2] some industries became interested in accident prevention in 1907. Since then much has been accomplished, but there is still much more to be done.

Each factory or industrial enterprise shows, when compared with others of the same kind, some specific local differences and problems. This may be the explanation for many injuries which do not occur at all or only to a minor extent elsewhere. Very valuable information may be obtained from local accident statistics and their comparison with statistics from other sources and places. Such information may be of appreciable help in attempting to eliminate the local hazards. We shall try to prove this statement with this article.

THE present national emergency, with its long working hours, the use of millions of new and inexperienced persons, frequently in poor health, and the altering of customary food habits, is a potential danger to the people employed in industry. The number of injured persons is steadily growing, and has probably amounted to three or more millions in 1942.

The figure of 3,000,000 accidents is based on a survey made by Kossoris[3] for 1940, when nearly 1,890,000 workers were involved in disabling injuries. More than 18,000 were killed or suffered disabilities totally disabling them for future work. Nearly 90,000 workers suffered partial but permanent disabilities, and 1,782,000 lost one or more days of work from injuries sustained on the job. "Increased employment, longer daily and weekly hours of work, and the failure to expand safety activities in many establishments which experienced marked increases in employment, largely accounted for a rise of 300,000 in the number of industrial injuries in the U. S. in 1940."[3] It is estimated that about 42,000,000 man-days were lost. The economic loss to industrial workers and their families and to the country itself as the result of these injuries can be hardly estimated. The annual loss of wages only is placed at approximately $1,000,000,000.

It can be expected that with further increases in employment, and with still longer hours of work, inadequate rest, and added restrictions concerning daily diet, the total industrial output will diminish and the number of injuries will reach the three million or even the four million mark. We are perfectly aware that neither new legislation nor scaring or warning men by means of posters and tiresome safety conferences will influence the volume of injuries. We are certain, however, that an interesting educational campaign, minor innovations in work routine and strict observation of well known but not used safety measures, will greatly reduce the industrial accidents.

Regardless of their importance, statistics of industrial accidents are a step-child of contemporary medical liter-

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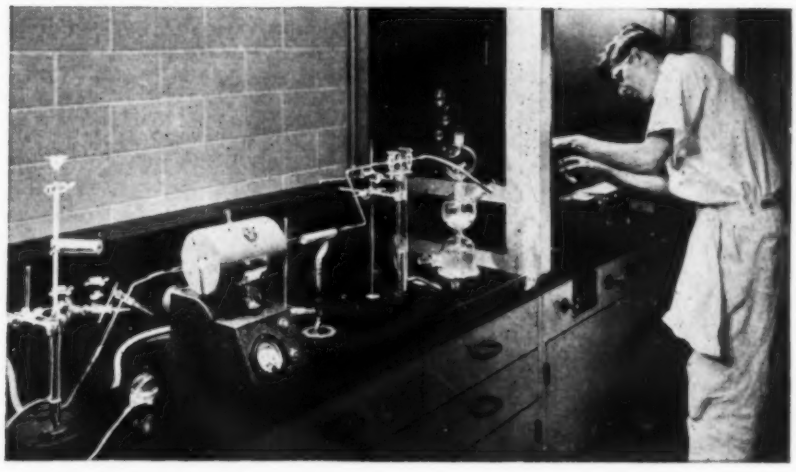

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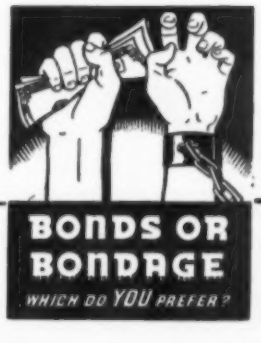

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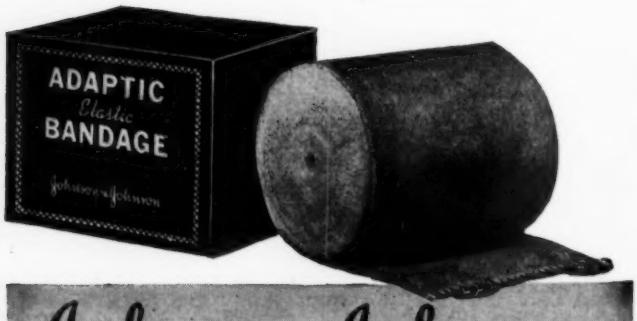

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ature, and we were unable to find many medical publications dealing specifically with them. The review of accident histories cannot be separated from preventive industrial medicine. An occasional scrutiny of the medical files can disclose a large number of cases which may allow interesting deductions. The nation-wide statistics show quite large local variations and, therefore, it is important that industrial physicians should be able to produce figures based on analyses of accidents treated in their dispensaries or offices. The pre-employment and the periodical routine health examinations are also part of the preventive health program. The short-sighted and uncooperative policy of many factory managements, afraid of seemingly expensive innovations and not aware of their advantages, often discourages any kind of work beyond the pure medical care. The supreme medical obligation to "cure" involves another, not less important, task—to prevent. Preventive medicine cannot be replaced by technical science. The technical science is in reality only a part of the preventive medicine, serving, assisting and helping where a special technical or chemical problem has to be solved. The same remark applies to the so-called "industrial nurse," whose duty is to administer first aid and to fulfill the obligations of a social worker but not to replace a physician.

WE ANALYZED 3,600 industrial accidents which occurred in small to medium-sized factories in a four and one-half year period. The histories were sifted and divided for comparison into two parts, one until December, 1941, and the other covering 1942. The following data are compiled from 2,240 charts for the period from July 1, 1938, to December 31, 1941, and 760 charts from the year 1942. Six hundred accident cases from the Northeastern Hospital of Philadelphia were treated separately. About 3% of all accidents concerned female workers.

The number of cases, especially in 1942, is insufficient to draw the right conclusions, and we should appreciate other publications based on larger industrial material, which would give us an opportunity to compare our figures.

TABLE I.
DISTRIBUTION OF ACCIDENTS (1938-1942)

Months	Number of Cases	Per Cent of Total
January	203	6.8
February	234	7.8
March	233	7.7
April	220	7.3
May	240	8.0
June	246	8.2
July	317	10.5
August	337	11.3
September	293	9.8
October	318	10.6
November	193	6.5
December	166	5.5
	3,000	100%

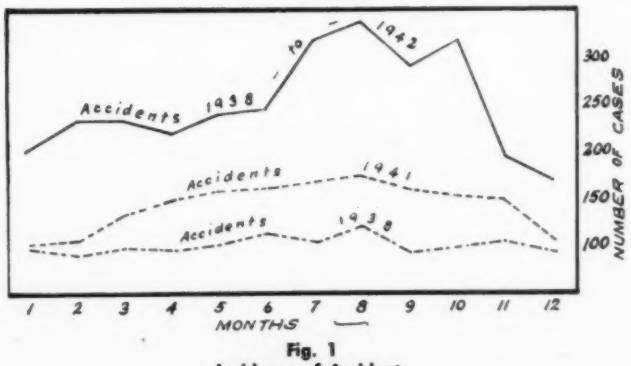

Fig. 1
Incidence of Accidents

The monthly figures are not evenly distributed. The warmer season, compared with the winter months, shows a slight increase of accidents. In some years this seasonal increase is especially characteristic. The development of untoward symptoms of fatigue and discomfort, due to climatic influence, is certainly responsible for the seasonally increasing rate of accidents.

Sayers mentions Hope's[5] observation that industrial accidents show a seasonal fluctuation similar to that shown

AN OLD PERSONAL PROBLEM NOW IS A MODERN PERSONNEL PROBLEM

Wars usually are accompanied by an increase in *Pediculosis,* a condition produced by head lice and crab lice. This condition also may become prevalent among war production workers in crowded factories and communities.

The problem of Pediculosis is of direct concern to management, as well as the individual, for a single case may lead to infestation of other employees. This is especially true because employees cannot always be depended upon to take prompt, efficient action to combat the condition. And a person who accidentally becomes infested may not know what to do and, because of embarrassment, may hesitate to seek advice.

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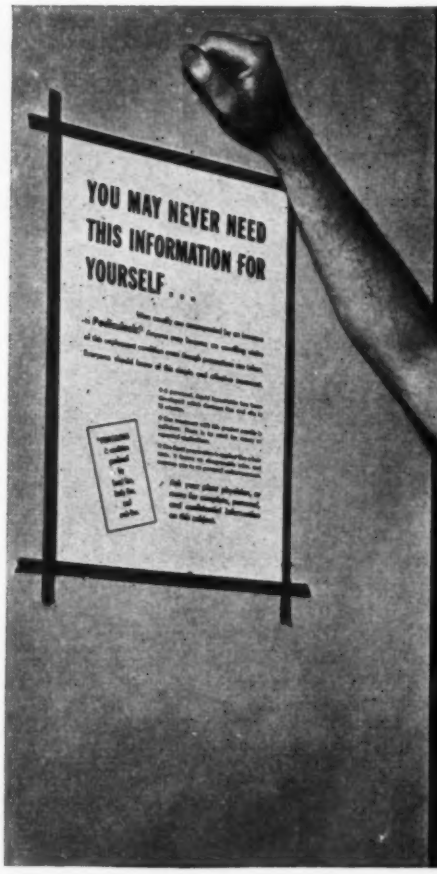

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in the amount of production. The accidents are more frequent in summer and under poor ventilation than in winter and under adequate ventilation, with one exception: very low temperatures may cause many accidents through stiffness of hands and slipping of tools.

Yaglou[6] states that the physical power of men is fully utilized in an optimum range of air conditions, depending also upon the kind and rate of work and the degree of acclimatization. Reduction of working capacity and development of fatigue are effected by significant changes of these conditions. Slight fluctuations of temperature and humidity within the normal range do not appreciably affect the working efficiency of men; but comparatively small increases of temperature above the normal range affect markedly the working capacity. "Disinclination for hard work in hot atmospheres is proved to be a conservative and protective natural instinct."[6]

Experiments conducted by the New York State Commission of Ventilation proved that 37% more work was done in a temperature of 68° F than in one of 86° F with 50% relative humidity in both cases. In the experiments of the American Society of Heating and Ventilating Engineers, the greatest amount of work was performed within the range of 40° to 75° F. With the rise of temperature above 75°, the output fell progressively. Twice as much work was done at an effective temperature of 70° as at a temperature of 93° F. The highest production is achieved in textile mills in Connecticut at an average outdoor temperature of 60° F during the spring and fall seasons. Higgins[7] observed, as quoted by Yaglou, that the output in the mines is directly related to temperature and humidity. In the Lake Superior iron mines, where temperature ranges between 80 and 90° with relative humidities close to the saturation point, the average miner works only one-half to one-third of his time. Four miners produced the same tonnage of ore as nine men in a similar place of the same mine but in a temperature 10 degrees higher. In England the maximum output in plate manufacture, with exposure to high temperatures, is, according to Vernon,[8] in the cold months of the year and the lowest in the warm season. When special means of ventilation are provided, the reduction of output is only 2 to 6%; window ventilation only reduces output 10 to 30%. "Abnormal air conditions in cold and hot trades are affecting working capacity, accident liability, sickness and mortality."[8] Folkhard[9] states that hot and simultaneously humid days cause a general physical depression by insufficient perspiration and heat congestion, and, therefore, more accidents.

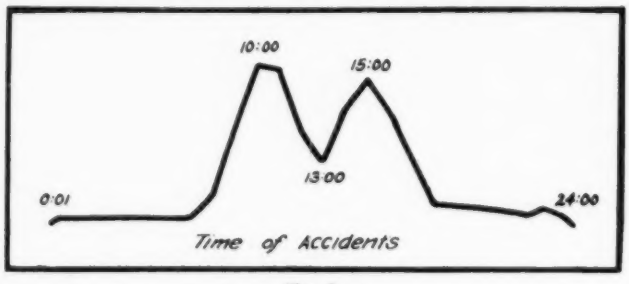


Fig. 2

The rising number of accidents in the warmer months was also observed by Osborne and Vernon,[10] who state that the lowest incidence of minor accidents in three British munitions factories was at 67° F. The number of accidents increased above and below the optimum temperature of 67°. The authors attribute the rise of accidents in lower temperatures to loss of manual skillfulness. The lowest rate of accidents in a fuse factory occurred, according to Hope, at temperatures between 60° and 69° F. Yaglou mentions the statement made by Vernon, Bedford and Warner,[11] who recorded an increased number of minor accidents with the rise of temperature. At a temperature of 81° F, minor accidents, with less than 10 days disability, were three times more frequent than at 63° F. Changes of temperature did not affect definitely major accidents.

On the basis of observations concerning industrial accidents, Folkhard stated that median temperatures and median barometric pressures were favorable and low temperatures and high barometric pressures were unfavorable. The favorable conditions prevailed during increasing temperatures provided that the barometric pressure was correspondingly lower. The influence of humidity in the air showed marked oscillations but, as a rule, more favorable conditions were encountered when the humidity was low, especially during the hot season. Rain in the cold season did not show special influence on the number of accidents, but rain during the warm season, particularly when following humid days, showed a decrease in industrial accidents. (Fig. 2.)

Accidents occurring in 1942 were listed in the same way as those from previous years. The D.S.T. and E.W.T. were not corrected. The registration of working hours was omitted because the data presented in Table II are compiled from different factories, where the beginning of the day shift is between 7:00 and 8:00 o'clock. It is well known that most accidents occurring during main working hours reach their peak in the morning between 9:00 and 11:00 o'clock and in the afternoon between 14:00 and 16:00 o'clock. The same observation was reported by Osborne and Vernon, Bristol[12] and other authors. Bristol states that the great majority of accidents occur in the morning between 10:00 A.M. (10:00) and 12:00 noon (12:00) and in the afternoon between 3:00 P.M. (15:00) and 5:00 P.M. (17:00). Because fatigue could be excluded in those cases, owing to the kind of work involved and the available rest periods, it is possible, according to Bristol, that these accidents are related to reduced energy with the approach of mealtime and the need for food.

In our survey, the number of accidents in the two critical

TABLE II.
TIME OF ACCIDENTS

Time	1938-1941 No. of Cases	1942 No. of Cases	All Accidents No. of Cases	All Accidents Per Cent of Total
0:01 to 1:00	9	3	12	0.40
1:01 to 2:00	9	5	14	0.46
2:01 to 3:00	8	2	10	0.33
3:01 to 4:00	8	3	11	0.36
4:01 to 5:00	11	2	13	0.42
5:01 to 6:00	11	—	11	0.36
6:01 to 7:00	11	6	17	0.56
7:01 to 8:00	51	19	70	2.33
8:01 to 9:00	166	57	223	7.43
9:01 to 10:00	266	97	363	12.10
10:01 to 11:00	260	98	358	11.93
11:01 to 12:00	156	68	224	7.46
12:01 to 13:00	102	32	134	4.46
13:01 to 14:00	187	71	258	8.60
14:01 to 15:00	243	93	336	11.20
15:01 to 16:00	204	60	264	8.80
16:01 to 17:00	133	31	164	5.46
17:01 to 18:00	43	17	60	2.00
18:01 to 19:00	28	16	44	1.46
19:01 to 20:00	26	9	35	1.16
20:01 to 21:00	22	8	30	1.00
21:01 to 22:00	16	11	27	0.93
22:01 to 23:00	25	10	35	1.16
23:01 to 24:00	11	8	19	0.63
UNKNOWN	234	34	268	9.00
	2,240	760	3,000	100%

(To simplify the whole matter of time, we adopted the 24-hour clock, as used by the United States Army and Navy.)

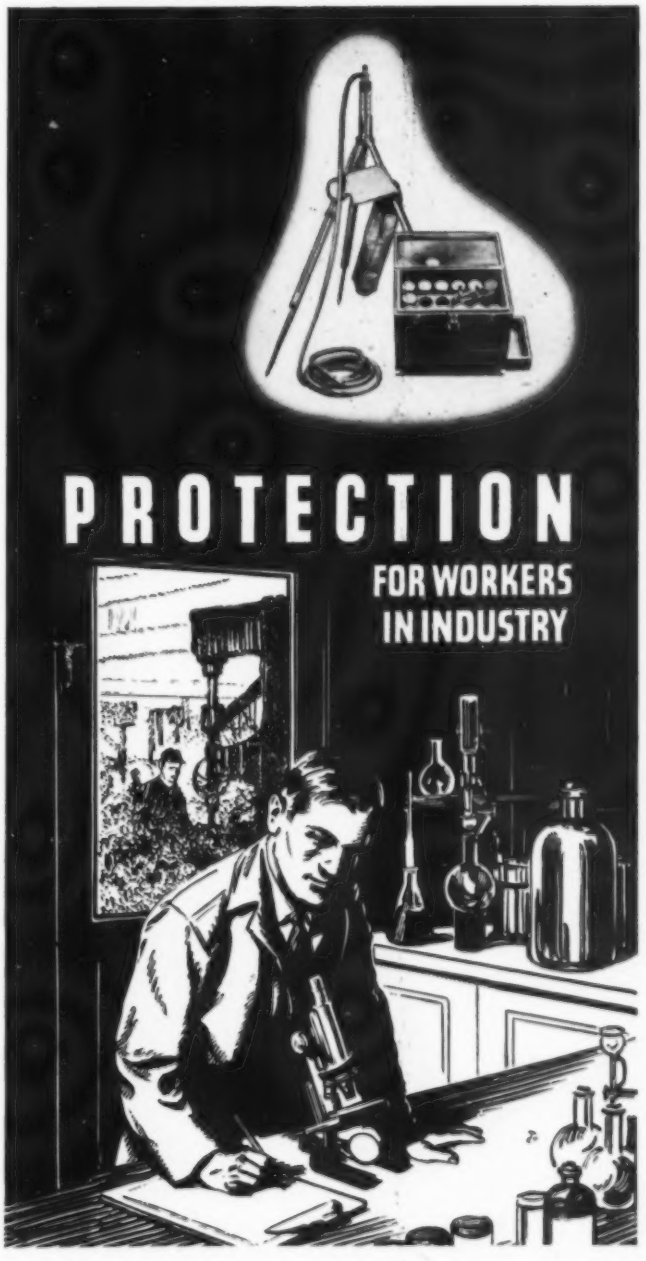
morning hours is higher than in the two afternoon hours.

The increasing physical fatigue is certainly responsible for the growing number of accidents between 14:00 and 16:00 o'clock but cannot be given as an explanation for the large number of injuries in the time between 9:00 and 11:00 o'clock. The number of accidents falls sharply after 11:00 o'clock and reaches the lowest stand at the usual lunch hour between 12:00 and 13:00 o'clock, to increase again after 13:00 o'clock. There cannot be any doubt that the increasing number of accidents in the morning is preponderately a medical problem only. The same observation, made also by Osborne and Vernon, speaks in favor of the theory that other factors than fatigue are responsible for the increasing number of morning accidents. The so-called "morning fatigue" deserves a thorough medical investigation. A complex of different personal components is responsible for this morning phenomenon. Besides other causes listed in this paper, the following seem to be important:

1. Mental fatigue.
2. Lack of concentration.
3. Lack of sleep.
4. Need for food.
5. Lack of vitamins (especially vitamin B complex).
6. Need for a short period of rest.
7. Dislike of work.
8. Abuse of alcohol or nicotine or both, especially the night before.
9. Sexual over-indulgence.

The importance and influence of the working environments as the cause of early fatigue (Garner,[13] Toland[14]) should not be overlooked. The inadequacy of temperature, ventilation and lighting, and the difference between those conditions at home and in the working place, especially to unaccustomed persons, may cause an unpleasant psychological reaction, directed against work. A short rest period and the friendly and helpful attitude of the immediate superiors and the fellow-workers may be of great help here. Carlisle[15] recommends, for women workers, a rest period of 10 minutes in the middle of each half-shift. One medium-size factory in Philadelphia accepted, years ago, a schedule suggested by Toland and introduced for the whole plant, a 15-minute intermission at 9:00 and 14:45 o'clock, and reduced in that way the previously high number of accidents to a minimum. Good results obtained with rest periods of 10 to 15 minutes duration were also reported from other places. Lack of adaptation or interest in work and poor concentration may be the reasons for a state of mind which, in combination with the hazards of work, may be the cause of accidents. It is well known that there exists a direct relationship between the mentality of the worker and the accident. The mental attitude of the worker is certainly important. Forster[16] thinks that this factor is of even greater importance in the causation of accidents than generally believed. A mental distraction outside the immediate field of work with automatic continuance of physical work but without balanced cooperation of mind and body may, according to Forster, cause an accident. Intelligence, and state of mind in relation to home conditions, as mentioned by Henninger and his coworkers[17] are other important factors. Psychical and physical fatigue, in general, are also eminent provocative causes for industrial accidents. Attitudes towards work, employer, fellow-workers, are—besides many other conditions such as loss of sleep, abuse of alcohol and nicotine, insufficient or inadequate food—other dominant reasons. We were unable to prove the statement of Henninger and his collaborators that persons of overweight are more liable to accidents than those of normal or underweight. Proneness to accidents, which is not identical with awkwardness, is another important psycho-physical factor. Slocombe and Bingham[18] proved that accidents are not distributed evenly among car operators. One-third of the operators was responsible for half of the accidents. In one group of 200 men, one-fifth of the motormen had 50% of all accidents in the group.

In the Survey of Industrial Mental Hygiene, Henninger, Kennon and Gomory mention the observation made by the Industrial Fatigue Research Board of Great Britain that the persons having the most accidents are those most frequently seeking medical dispensary advices for minor illnesses. Forster estimates that about one-fourth of all



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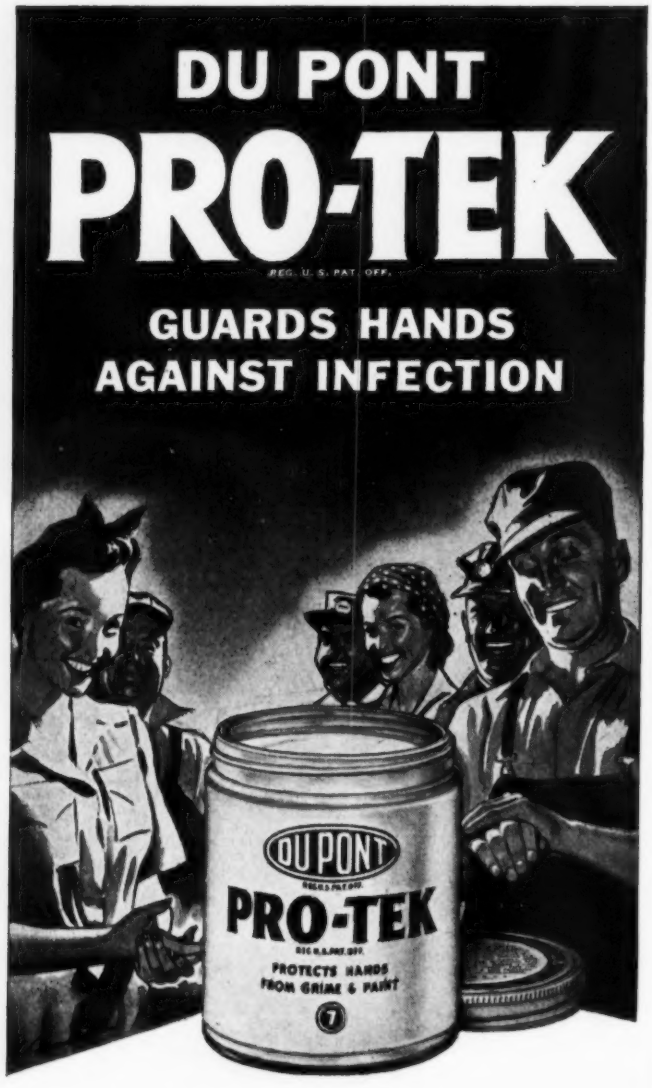

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workers are "accident prone." The Industrial Health Research Board of Great Britain[19] attributes a specific factor to certain individuals called "accident proneness." Ten per cent of a group may be responsible for 75% of all accidents occurring among them. "Accident proneness" is, according to the same source, "a relatively stable quality obeying fairly definite laws. Moreover, those who are most often ill tend, on the whole, most often to have accidents." Such persons, being otherwise normal, can be usefully employed provided that they are assigned to less dangerous work. Alcoholism and chronic nicotinism are big risks in industry. The influence of chronic alcoholism and also even occasional abuses of it, diminishes greatly the physical efficiency of the employee, decreases his power of concentration, and makes him more liable to accidents. Lack of sleep or excessive sexual practices are other, often overlooked, predisposing causes. Haggard and Greenberg[20] point out a type of fatigue through reduced energy due to need for food. Drop of efficiency and productivity may be related to such conditions and not to actual fatigue and weariness.

Our present knowledge of vitamins points also in another direction. The average food is low in vitamins, and especially in vitamin B complex. Stiebeling and Phipard[21] have shown that the thiamin intake of workers is generally far below the daily minimum requirement. Manifestations due to thiamin deficiency, such as fatigue, muscular weakness, mental and physical inactivity, listlessness, diminished capacity for work, etc., are relieved by oral administration of vitamin B_1. Newer investigations conducted by Johnson and his associates[22] in the Fatigue Laboratory of Harvard University, convinced the authors that thiamin alone in amounts of 2 mg. daily is not sufficient to keep workers in good physical condition. One-half mg. of thiamin, added to other elements of vitamin B complex proved to be very satisfactory.

The connection between impaired health and the liability toward accidents should not be overlooked. Sappington[23] found that women, rated by physical examination as third class, had nine times (men two times) more accidents than those rated first class, despite the fact that those people, rated physically as third class, were employed in places with low accident risks.

The influence of increasing bodily fatigue in the afternoon hours on output, quality of work and incidence of accidents, cannot be denied but is certainly over-estimated, at least so far as it concerns the accumulation of symptoms of fatigue. Eight to 10 hours' rest seems to relieve all physical but not always all mental fatigue effects. An accumulation of weariness, a state of progressive mental and physical exertion, can be noticed only after a longer period of time when work is continued for weeks without days of rest between them. Otherwise, we would anticipate more accidents in the second half of the week instead of in the first half. A survey conducted by ourselves for three months, in the accident dispensary of the Northeastern Hospital of Philadelphia (Chief, Dr. Joseph J. Toland, Jr.) showed that, in nine out of 13 weeks, most accidents occurred between Monday and Wednesday and not at the end of the week. Only one week in March showed the same amount of accidents on Monday as on Thursday. (Fig. 3.)

There still remains the open question: Are the mental attitude and dislike of work caused by long hours of a seven-day week, without relaxation and proper diversion, more dangerous than the physical fatigue itself?

The Industrial Fatigue Research Board of Great Britain, as mentioned by Henninger and his associates, comparing

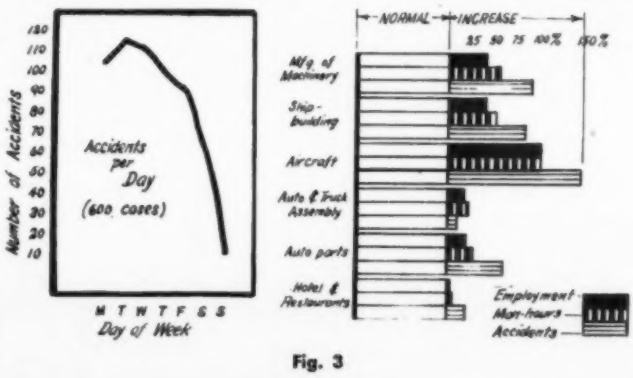

Fig. 3

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day and night work of a group of males, did not find important differences in the accidents. Figures given by Ryan,[24] on accidents on night shifts in a U. S. fuse factory, were at a maximum in the second and third hour after the beginning of work. The extended working hours do not correspond directly with the total output of the factory but do increase the liability toward accidents. Increase of working hours over a certain optimum slows down the whole production. The change from a 40-hour to a 60-hour week, as seen in France in 1939, did not increase the output more than 20 to 25%. The results obtained in England in this war seem to be similar. The muscular capacity of the human body is limited and relatively quickly exhausted, especially when speedy work in unpleasant surroundings is required. Garner, in his paper, mentioned the fact "that, in some instances, shortening of the day's work has really resulted in an increase in the amount of work done." Reduction of hours of work effected only a moderate reduction of accident frequency, not exceeding in the most extremely favorable case, 23%.[10] The increased tempo of production and the prolonged working hours are in direct relation to the growing number of accidents. Kossoris illustrates this (Fig. 3) as follows:

With the exception of industrial enterprises occupied with the assembly of automobiles and trucks, which reported only an increase of 10% in injuries against a 17% gain in employment and a 22% advance in the total number of hours worked, all other industries here listed show a marked rise of accidents. Even the personal service group, such as hotels, restaurants and laundries, shows a sharp gain in accidents. These figures illustrate clearly the fact that fatigue itself—due to overwork, lack of good and trained personnel, and many other partly mechanical and partly personal elements—is responsible for a large number of industrial accidents. In short, fatigue, mental and physical impairments, surroundings, long working hours, type and speeding up of work, poor working place, poor lighting, improper personal attitude toward fellow-workers, employers, management or superiors, poor nourishment, and many other more or less important factors are the contributing causes of industrial accidents. The influence of climate, ventilation, air-conditioning, noise, monotony, posture, mechanical deficiencies, non-use of safety devices, lack of protective clothing, lack of good shoes, etc., are directly or indirectly responsible for many accidents, while such factors as good health, good vision, good hearing, adequate nutrition, mental balance and relaxation, manual dexterity, intelligence, liking for work, correct personal attitude, experience and willingness are the positive activations of an employee whose record is accident-free.

ANOTHER group of accidents must be considered here. This group is quite large and is caused by mental and mechanical deficiencies. Forster estimates that 90% of all accidents are of mental origin; not from insanity or mental incompetency, but from thoughtlessness or carelessness, confusion or bad judgment. Garner states that, "Between 80% and 90% of all accidents are directly or indirectly attributable to man failure in some of its forms," and only occasionally the accidents are produced by mechanical failure and entirely beyond human control. According to National Safety Council,[25] two out of three accidents have both personal and mechanical causes. Studies conducted by the N.S.C. attribute one-fourth of serious injuries to improper guarding as compared with only one-tenth in tne study which included less severe injuries.

Age of Injured	Table III. (in 3,000 Cases)		(in 600 Cases)	
Age	No. of Cases	Per Cent of Total	No. of Cases	Per Cent of Total
16 to 20	411	13.7	102	17.
21 to 25	665	22.2	126	21.
26 to 30	520	17.3	100	16.7
31 to 35	414	13.7	70	11.7
36 to 40	276	9.2	68	11.3
41 to 45	205	6.8	44	7.3
46 to 50	202	6.7	35	5.9
51 to 55	139	4.6	24	4.
56 to 60	71	2.3	18	3.
61 to 65	53	1.8	8	1.3
66 and over	42	1.4	5	0.8
Unknown	9	0.3	—	—
	3,000	100.00%	600	100.00%

Fig. 4 shows that the younger-age classes sustain more accidents than the older one. Our figures conform to the figures given by Mettert,[24] who lists the older-age groups as those who suffer less injuries. The employment of a relatively higher percentage of younger-age groups as compared with the older groups may have considerably influenced the above statement. Unfortunately, we were not able to compare the age of the injured with the number and age of all employed persons.

The following Table IV is partly reproduced from Mettert's publication:

Klebba, in her survey of material collected in over 700,000 urban households in the U.S. on non-fatal industrial injuries, occurring among 784,717 white and colored workers, 16 years old or over, found that the number of accidents of male manual workers and of all female workers, disabling at least for one week but less than one year, rises steadily with age. The rate of accidents rises from 15.3 for male manual workers 16 to 24 years of age, to 22.0 for the same category of workers 65 years and over. Moreover, the average duration of periods of disability increases directly with the age of the injured. The rate rises from 1.9 for all female workers 16 to 24 years of age to 2.6 for the age group 55 to 64 years. Male non-manual workers have the highest rate of 6.4 in the age group from 16 to 24 years, with a trend downward with advancing age. The rate of disabilities for more than one year's duration increases with advancing age from 1.1 for persons 16 to 24 years, to 4.8 for persons 65 years and over, with the annual frequency rate of 1.0 per 1000 employees. Klebba found, for the group of industrial injuries with disability of at least one week and less than one year duration, an annual frequency rate of 9.6 per 1000 employees.

The injuries of Table V were listed in 3000 cases.

A clear division of the injuries as to their part, is, in many cases, not quite possible. We listed, therefore, the more severe injury only, disregarding other minor injury

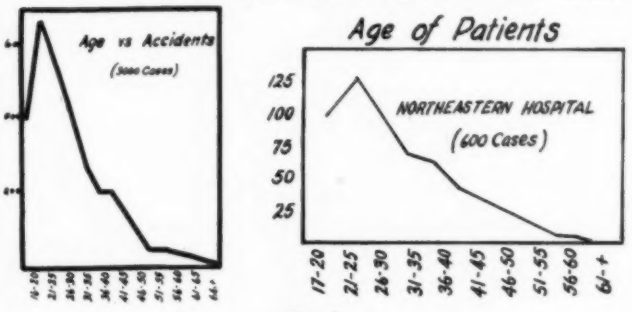

Fig. 4

Table IV.	No. and Age reported	Per Cent, whose Age was							
		16 to 20	21 to 25	26 to 30	31 to 35	36 to 40	41 to 45	46 to 50	51 and Over
Indiana	M. 16.747	3.3	32.5		27.5		21.0		15.7
	F. 1.085	13.7	45.2		19.8		12.6		8.7
Maryland	M. 7.872	7.8	16.1	16.9	13.7	13.3	10.7	8.3	13.2
	F. 547	20.7	20.3	15.0	9.5	11.9	7.5	8.0	6.8
Massachusetts	M. 31.106	7.8	16.6	15.3	11.9	13.1	10.6	8.9	15.6
	F. 4.111	16.9	19.9	13.0	18.4	9.9	8.8	6.3	6.7
Michigan	M. 17.685	5.2	15.0	15.1	14.4	15.2	12.4	9.2	13.5
	F. 1.012	13.5	22.3	19.1	12.7	12.2	7.4	4.9	7.8
Minnesota	M. 19.640	5.8	17.0	17.2	15.1	14.0	10.7	7.9	12.1
	F. 2.015	17.0	27.2	17.9	9.7	9.9	7.0	4.9	6.3
Rhode Island	M. 1.913	10.0	16.0	14.1	11.0	11.9	10.5	9.1	17.4
	F. 317	20.2	25.6	14.2	10.1	12.0	7.6	5.0	5.4

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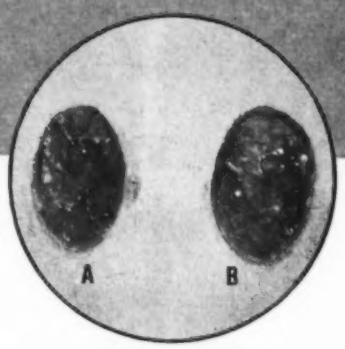
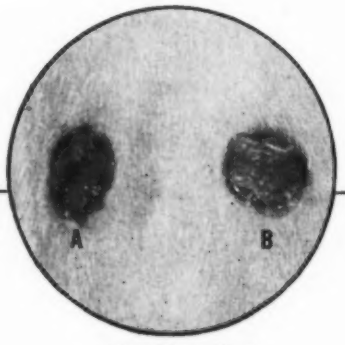
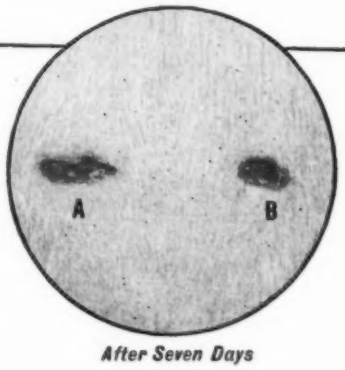


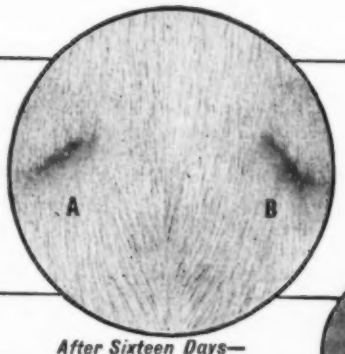
Beginning of Test



After Three Days



After Seven Days



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*Swartz & Reilly, "Diagnosis and Treatment of Skin Diseases," p. 66.

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TABLE V.

Type of Injury	No. of Cases	Per Cent
Injuries to eyes	131	4.4
Injuries to fingers	1,008	33.6
Injuries to hands	277	9.2
Injuries to wrist and forearm	260	8.7
Injuries to toes	160	5.3
Injuries to foot-soles	41	1.4
All other injuries	1,123	37.4
	3,000	100.00%

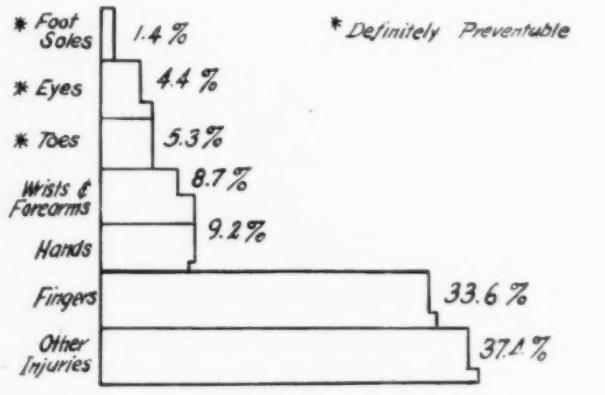

Fig. 5

obtained in the same accident which itself would not cause much trouble and would not interfere with the worker's ability to continue work after a first aid treatment. "Accident Facts,"[27] 1942 edition, lists slightly different figures compiled from 1938 data from six compensation commissions:

Part of the Body	Per cent
Eyes	4.00
Head (except eyes)	7.00
Arms	9.00
Trunk	20.00
Hands	8.00
Fingers	22.00
Legs	13.00
Feet	8.00
Toes	5.00
General	4.00

Mettert listed the following injuries as reported from Indiana for 1934 and from Pennsylvania for 1933:

	Indiana, 1934	Pennsylvania, 1933
Number of injuries	M. 16.072 F. 1.028	M. 80.745 F. 4.893
	Per Cent of Total	
Upper extremities	M. 38.2 F. 63.4	M. 37.5 F. 52.7
Lower extremities	M. 28.1 F. 20.7	M. 29.1 F. 25.5
Trunk	M. 19.5 F. 9.1	M. 20.6 F. 13.8
Head	M. 9.1 F. 3.5	M. 9.3 F. 5.4
Other and non-reported	M. 5.0 F. 3.3	M. 3.5 F. 2.7

According to Davis,[28] more than one-third of all industrial accidents in North Carolina, during the reported period, were hand injuries. Eckelberry[29] mentions that from 69,777 accidents in 1935 in New York State, there were 22,523 accidents to hands and fingers. Hays[30] found, in 332 surveyed industrial accidents, that 35% were injuries to the hand. Bunnell[31] estimates that over half of the industrial accidents are to the hands. Conforming with other statistics of industrial accidents, our own figures show that the fingers are most frequently hurt.[32] Our own figures for injuries of hands (9.2%) and fingers (33.6%) are slightly higher than those of Eckelberry, Hays, and Davis, but lower than Bunnell's. The liability to injuries of the upper extremities is much higher for the female sex. The comparison of the figures from Indiana and Pennsylvania, as listed by Mettert above, shows 60 to 70%

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Type of Injury	Injuries to Hands No. of Cases: 78 Right: 38 (49%) Left: 40 (51%) No. of Cases	Per Cent	Injuries to Wrists and Forearms No. of Cases: 95 Right: 49 (51%) Left: 46 (49%) No. of Cases	Per Cent
Abrasions	..	...	2	2.2
Contusions	16	20.5	..	....
Abrasions and contusions	5	6.4	29	30.3
Lacerations or puncture wounds	33	42.3	21	22.1
Lad. with injury to tendons	2	2.6	1	1.1
Burns	10	12.8	3	3.2
Fractures	2	2.6	12	12.6
Sprains	1	1.3	11	11.5
Foreign bodies	1	1.3	2	2.2
Infections	6	7.6	10	10.5
Tenosynovitis	1	1.3	4	4.3
Traumatic arthritis	1	1.3	..	....

higher incidence of injuries of the upper extremities for female workers as compared with the male workers from the same state. Kossoris, in his excellent paper, states that injuries to fingers or to the hands are the cause of the largest proportion of permanent, partially disabling impairments, reaching 77% of all permanent disabling injuries. The following injuries were analyzed from the first 1000 of our accident histories: The Table above gives details on all injuries to hands, wrists, and forearms. There was not a marked difference between the right and the left side. And the Table below analyzes 52 injuries to toes.

Nearly all of the toe injuries occurred in the manufacturing group, especially in sheet metal, smelting, refining and galvanizing industries. Beside those manufacturing groups, the wood and building industries show also the highest figures of injuries to lower extremities as recorded by the Fédération Internationale Des Travailleurs Du Bâtiment Et Bois,[33] and based on German accident statistics. Most of the toe injuries, however, were direct results of weights dropping on the toes, a fact confirmed also by Smith and Rider.[34]

Very interesting is the observation, made also by other authors, concerning the low incidence of infections of foot and toes as compared with finger and hand injuries. Our figures show an incidence of 1.9% of infections of toe injuries against a 21.4% of finger injuries.

In our survey of 3000 accident cases, there were 131 injuries to eyes with 24 cases of traumatic conjunctivitis due to removal of foreign bodies by fellow workers and to irritation by other causes, such as dust, chemicals, radiation, etc. With the exception of single cases of burns, abrasions of the cornea and corneal ulcers, all other cases were foreign bodies. All complicated eye cases were referred, at once, to an ophtalmologist.

In 3000 cases we had 41 injuries to the plantar surface of the feet, such as puncture wounds and minor lacerations.

Disastrous and discouraging are the figures of injuries to toes (5.3%), plantar surface of the feet (1.4%), and eyes (4.4%). The above figures could be perceptibly lowered by strict application of existing safety rules. Intensive training in the use of safety devices and proper supervision could eliminate completely all of these accidents. Three hundred thirty-two easily preventable injuries were listed in our survey. Eleven per cent of all accidents could be eliminated! The same figures in nation-wide statistics mean the loss of millions of man-hours and millions of dollars in wages, besides irreparable losses in production. It is the fault of all concerned groups (employer, employee, and medical service) that such conditions still prevail. The fact that there are two to four times as many accidents, not related to industry, to employees while off the job, is not an excuse for our failure. According to Lynch,[35] off-duty mishaps cause twice as much lost time as do accidents occurring in work. Culler's[36] statement that the best protection against loss of time and wages is the prevention of injury to the eyes, must be fully endorsed. Guilbert[37] says that from all "injuries sustained by industrial workers, those of the eyes are utterly preventable and wholly inexcusable." Small flying objects from metal-working machines are the main hazards to the eyes. Allen and Carman[38] estimate that 80% of all industrial traumata of the eyes are due to flying bodies, 8% to tools or parts of machinery, 7% to splashing liquids, 2.5% to explosions, 2% to falls, and 0.5% to infections. According to Mason,[39] at least 60% of all industrial accidents to the eye consist of foreign bodies. The restricted space does not allow us to mention the whole literature dealing with the problem of industrial injuries to eyes. From a large number of publications, we bring here only a small selection: American Safety Code,[40] U. S. Dept. of Labor,[41] Allen,[42] Lloyd,[43] Resnick,[44] Lewis[45] and Simpson.[46]

The statistics of industrial injuries to the eye do not list chronic irritations due to industrial poisons about which comparatively little is known. Allen and Carman mention only this fact as another industrial hazard to the eyes. Another source of chronic irritation of the eyes is eyestrain caused by poor illumination. Poor lighting is not only affecting the eyesight but is also the explanation for accidents due to impaired vision and obscuring of hazardous conditions. Culler, in his paper, stresses the importance of proper illumination without glare, and thinks that many industrial establishments have an illumination far below efficient levels. Simpson estimates that bad lighting and poor vision are the major factors in one of every eight accidents.

Mayer[47] summarizes the protective techniques for eyes:

1. Control of toxic materials, gases, dusts and vapors.
2. Use of protective goggles against flying objects and radiant energy.
3. Provision of adequate and suitable illumination.

It is not necessary to stress the importance of protective, spark-proof clothing for special jobs but it seems advisable to repeat once more how important are good shoes with sturdy leather soles. The working clothes, in general, should be of such kind that any danger of being caught by a moving or rotating part of a machine is excluded. Women should cover their hair and men should avoid long ties. To protect the feet from burns by flying or splashing particles or sparks, as support and as prevention against ankle sprains, high shoes seem to be far better than low shoes. Leather gaiters are also recommended. Protection of toes against injuries by means of steel rein-

Toe	1st	2nd	3rd	4th	5th	1st and 2nd	3rd and 4th	2, 3 and 4th	3, 4 and 5th
How Many Times Right: 26 (50%) Left: 26 (50%)	39	1	1	..	6	2	1	1	1

Injuries	Number	Per cent
Lacerations	4	7.7
Contusions	29	55.9
Abrasions	1	1.9
Fractures	11	21.2
Fractures with loss of Nail	2	3.8
Puncture wounds	1	1.9
Crushing injury	2	3.8
Traumatic amputations	1	1.9
Infection	1	1.9
	52	100%

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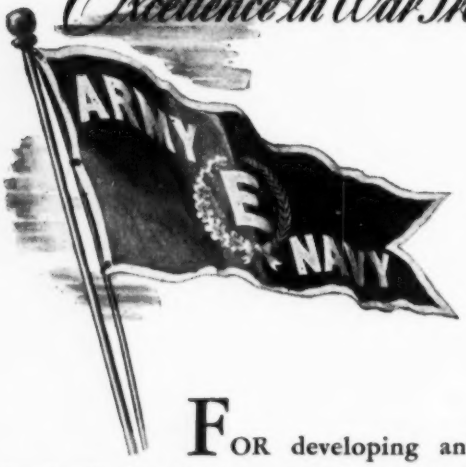

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forced caps (safety shoe) is constantly neglected. The disinclination of so many employees to buy special foot wear, induced Toland to construct a new safety device. This appliance is adaptable to all kinds and sizes of shoes and, with proper maintenance, is of unlimited durability. It protects not only toes but also the whole dorsum of the foot. The light weight does not interfere with walking and does not cause fatigue. The change of size can be accomplished in an easy manner through simple shortening or widening of the steel bands. The entire guard may be removed when lighter work is being done.

From other safety devices used by individuals, we should like to mention the more important: Helmets, breathing masks, protective shields for welders, eye and face shields, gloves, special asbestos outfits, rubber gloves and shoes for persons working on high-tension machines or conducting wires, etc. One relatively simple but eminently important safety gadget, the goggles, deserves special consideration. Wearing goggles, not merely having them, gives the protection to the eyes. It is the duty of all plant managements, safety directors, superintendents, and physicians to insist upon wearing goggles wherever hazards to eyes exist. It is their duty to prevent the unnecessary accidents with all their consequences, arising from disobedience to this rule.

Fig. 6

Guilbert[48] points also to a momentous psychological factor, the confidence and feeling of security which wearing of goggles instills. There are different kinds of goggles on the market, according to the hazard they guard against. The goggles MUST be individually perfectly fitted, and, according to Walder,[49] readily sterilized by boiling or by chemicals, besides being non-conductors of heat and electricity. The maintenance of goggles and immediate repair of broken parts is exceedingly important. Construction and adjustment of security devices on machines are a technical and not a medical problem.

According to Henninger and his collaborators, about 20% of all industrial accidents could be prevented by mechanical means and by education of the employee. Thorough instruction of the personnel is recommended by Raymondaud,[50] who regards ignorance of possible dangers as one of the most important causes of accidents. An intensive, interesting and not tiresome educational safety program would, without any doubt, greatly aid the unified efforts of all involved organizations. The creation of a head organization with representatives of all interested groups, including the workers unions, for preparation and conduction of a nation-wide campaign would be the first step towards a better and safer future for all working men. An educational program based only on posters,* placards and occasional lectures without adequate moving pictures is not sufficient. Educational films, based on the Phonoptic[51] method, seem to be, at the present time, the most impressive and interesting. Phonoptic pictures do not need a special commentator, do not become obsolete, and can be used everywhere, at home and abroad, where a sound-moving picture outfit is available.

Large industries and insurance companies have a special technical personnel to investigate all industrial accidents. The introduction of new work methods and security devices as a result of the work of those men has already greatly diminished hazards. German associations of workers have demanded that men be appointed to help prevent accidents. According to Ernst,[53] these men are to receive special theoretical and practical training for this purpose, so that they may cooperate with the technical supervisor and physician of the establishment. But all those measures do not solve the most important problem. The one-sided analysis of an accident does not include the

*A collection of accident posters as used by the Bell System operating companies is shown by Elstun[52] in his paper.

* With men in the Army, the Navy, the Marine Corps, and the Coast Guard, the favorite cigarette is Camel. (Based on actual sales records in Post Exchanges and Canteens.)

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necessary attention to the injured itself. This part must be done, and in many places is being done, by the physician and his trained staff. "Something pushed me against a chain," was the explanation given by a worker who had severe lacerations on both hands. It was not very difficult to obtain the further information concerning that "something." It was a night full of excitement and lack of sleep caused by the arrival of a new baby. Here is an explanation for a quite severe injury which disabled the patient for many weeks, causing material losses to the injured and high expenses to the insurance carrier. Would it not be better if this young father would stay out of work for one day? No, because his help is needed at his place of employment and absenteeism should not be tolerated. A good social worker would take care of this man before he got hurt. The social worker, keeping track of all private or familiar events, would know ahead of time when the delivery was expected and would act immediately after receiving the confirmation about the child's birth and other circumstances of the previous night. The placing of the involved man on a not dangerous job for one day only, would save all the trouble. It is our firm belief that a good organized social service is of great value for the management and the employees. Coulter's[54] remark that "an ounce of prevention is worth a pound of cure," meets here our full approval.

Part-time work for partly disabled and convalescent persons is important, not only from a psychological but also from a social and economic standpoint. It would relieve, at least a little, the present shortage of working men to induce the above-mentioned groups to return to their jobs in order to get wages which would be higher than the usual compensation. Tens of millions of otherwise lost man-hours could be saved by employment of incapacitated persons on the day shift for four hours each, with earnings higher than the regular compensation. Persons in the lower income classes should get paid the difference between their reduced wages and the usual compensation by the insurance carrier.

The pre-employment examination has also to be mentioned here. The examining physician should not deny the right to work persons without due consideration of physical ailments. Some of the latent or chronic defects, poor eye sight, etc., can be corrected. According to Irwin,[55] it is not sufficient to advise the persons seeking employment to have necessary corrections done, but it is essential to see them again after some time, to find out if the proper treatment for elimination of their defects was carried out. The physician has to advise the employer about the kind of work the person can perform to the best of his ability and has to reject only individuals who would be a direct menace to themselves or to fellow workers. The elimination of some persons through the pre-employment examinations is important not only for the prevention of accidents but also, in the opinion of Irwin, as prevention of prolonged disability from injury due to a pre-existing chronic disease or alcoholism. The physical examination, according to Sayers,[56] is the best protection of the health, life and interest of the worker and his family. The experience of the industrial physician is often contrary to the experience of a physician on a draft board. The first gets too many negative histories, the latter, too many positive. The lack of an adequate history may render more difficult the task of an industrial physician. A thorough examination may reveal pathologic conditions unknown even to the examined person himself.

Defective vision is a very frequent impairment among our urban population. The fact that approximately six times as many perceptions are based on vision as on all the other senses combined, and that about 70% of all our muscular activities are initiated in response to impulses induced by the sense of sight, explains why visual efficiency is so important for industrial work. Jackson[57] states that "The exactness of orientation and coordination depends on accurate vision which is often impossible without correcting lenses. Instant response to impending danger cannot be developed in one who has myopia or astigmatism, except for the limited range of accidents that can be apprehended with diminished visual accuity."

Of equal importance to the physical fitness is the determination of the nervous system, mental state and fitness

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for the work required (Henninger and co-workers; Raymondaud and others). The introduction of special tests for examination of mental fitness and reaction would help management to put the employee on that job which he is best fitted. Active immunization with tetanus toxoid should be performed routinely where occupational hazards make the preventive treatment advisable.

The partial or complete periodical health examinations of all employed persons depending upon the type of work and occupational health hazards and the re-examination of employees after any illness or injury, are other useful assets in preventive industrial medicine.

The factory of tomorrow will be air conditioned, well illuminated, and more or less noiseless. Alcohol-free canteens directed by experienced dieticians, music and recreation facilities, social service, and permanent medical and nursing service will be available. A few factories already having some of the above mentioned facilities function very satisfactorily.

Large industrial areas will have special hospitals for industrial surgery, or at least special departments in general hospitals. Such hospitals or departments are not only highly desirable from a medical point of view but also economical, through better supervision shortening the duration of hospitalization and the period of disability. Hospitals for accident surgery and occupational diseases will prepare physicians and nurses for industrial work. Practical training in such highly specialized institutions and a thorough knowledge of industrial hygiene, industrial medicine, psychology and general understanding of technical problems and working conditions, will greatly aid the physician in his efforts not only to treat but also to prevent accidents. Sayers says that the work of a plant physician should not only be confined to the plant dispensary but should reach all departments and all activities of the organization.

SUMMARY: "We have not awakened as a nation to the seriousness of our industrial losses from minor accidents. . . ." (Allen). The innumerable victims of production are a constant reminder of the speedy technical development and the slow adaptability of the human mind and body to the climate, working surroundings and the modern machine.

The reduction of industrial hazards and accidents to a minimum and the maintenance of a uniform production level are the goal of the medical and technical science. An extensive educational campaign and the strict observation of all safety rules would reduce the number of accidents and eliminate at least 80% to 90% of all injuries of eyes, and of feet and toes. A joint, permanent conference of all interested groups should prepare a nation-wide safety campaign and outline all practical steps for the future. The present national emergency with a maximum of employment and steadily rising figures of all industrial accidents requires energetic and fast decisions.

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INDUSTRIAL HEALTH and DISEASE

Industrial Absenteeism

—Its Medical Phase—

R. FRANKLIN JUKES, M.D.

AN IMPORTANT and controversial subject closely related to our war effort is industrial time loss from absenteeism. This matter is being currently investigated by several Federal agencies. It seems that a number of causative factors are involved. Due to high wages the rising affluence of the average worker in war industry tends to make him relatively independent, so that he take a few days off on slight excuse without being pinched financially. This and other causes are being reviewed and already legislation is being discussed to force men to remain on the job. In the sometimes bitter debates on this subject an important factor related to absenteeism from work seems to me to be passing relatively unrecognized and certainly not given the consideration it deserves.

Ohio State M. J., July, 1943.

For the past 15 years, in the course of the practice of medicine in a fairly typical mid-western industrial city, I have had occasion to observe the trend of fluctuating working conditions on the general physical and mental health of the factory population. During the past year I have been impressed by a marked increase in the number of patients presenting themselves for medical advice with a large variety of complaints due primarily to functional instability of the nervous system. This may be termed the "fatigue syndrome." These symptoms may reach a point where the patient will take the day off from work to come to the Clinic for a check-up. He feels that he is slipping and finds it increasingly difficult to continue working regularly. A fairly uniform pattern of events seems to lead up to this situation which I will briefly outline and will then illustrate by summarizing a few typical cases.

First I should state that, as in most industrial cities, the local factories have greatly increased their production to fit in with war contracts and that new industries and factories have been built. Thus the industrial population has grown, attracting to its ranks many men who are not used to factory work. Former automobile salesmen are typical additions, men whose previous employment was not particularly strenuous. Some of these men perhaps were formerly doing sales work because some inadequacy kept them out of more arduous occupations. Many in normal times would consider themselves too old for factory work. It must be recognized that such groups of men recruited for factory work are less liable to stand up well under stress and strain than regular factory employees. The large and increasing number of women now working in war industry represents a group in which the fatigue syndrome is even more prominent and with an even greater variety of clinical symptoms.

The average patient coming for medical advice gives a fairly typical history. Most have been working six or seven days a week for the past year with little or no vacation. They complain of fatiguability and exhaustion. They are tired when they get up in the morning. They often have to leave home early for work because of crowded bus and transportation conditions. Some have been unable to obtain housing reasonably close to their place of employment. They may have such symptoms as headaches, dizziness and backache. They have begun to develop symptoms relative to the dysfunction of various organs. Some are heart conscious, many have various gastro-intestinal complaints. Functional breathing difficulty with tightness in the chest is common.

With these symptoms there is the usual anxiety neurosis, the fear that they may have heart disease, cancer, etc. Many have already stayed off work for a day or two at a time. With a short rest they feel better but the symptoms recur and get worse as time goes on. I notice too a trend in some to turn to alcohol for relief. A number of men have told me that after work they stop in and get a few drinks, this being the one thing that they have found to be helpful in relief of their symptoms. Some are already doing this to considerable excess, even to the point where they lose time from work due to alcoholism.

The seven-day week is common among those who are foremen or are doing supervisional work and is apparently expected of them. The average worker who works a seven-day week is not required by management to do so, but is paid time and one-half for Sundays or overtime. With this incentive many have worked every day for over a year. I submit that the average man cannot do this and continue to feel well. Yet it is surprising that such a man will keep it up until he feels "sick" and will then come to the doctor thinking that his uncomfortable symptoms are due to heart disease or to some other specific organic condition.

The following case histories are selected as typical of 50 such cases seen during the past three months. The patients were all studied adequately, receiving a complete physical examination, routine laboratory examination of the blood and urine, and whatever special studies seemed indicated, such as electrocardiograms, x-ray studies of the chest and gastro-intestinal tract. In each instance of this series no evidence of organic disease was found.

CASE I: F. H. Age 31. Chief complaint, "heart trouble."

This man stated that yesterday evening just after supper he became nauseated and vomited. His heart seemed to be fluttering and he fainted in the bath-room. He thought that fainting was due to a weak heart. He stated further that over the past three months he had noticed progressive weakness and exhaustion. He felt tired when he got up in the morning. He complained of gas on the stomach, which seemed to crowd his heart.

On questioning it appeared that he had been working seven days a week continuously for the past 18 months. He was a toolmaker on an eight-hour day and frequently worked nine or 10 hours. On two occasions in the past month he had stayed off work for two days at a time because he felt "weak." After these short rests he felt temporarily better.

CASE II: W. S. Age 40. Chief complaint, "weakness."

This patient complained of being weak in the legs. He had "spells" when he would become light-headed, weak

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and would break out in a sweat. These attacks were not relieved by eating and bore no time relation to meals. He had been getting progressively nervous during the past two months and was completely exhausted at the end of the day. He had found that drinking wine made him feel better and relieved his nervous tension so that he could sleep. His wife stated that he was now drinking over a quart of wine daily.

This man had been on a seven-day week for the past year on "piece work" where he had to work fast to keep up with the machine. His regular work week was six days but, since he got time-and-one-half for Sundays, he was working seven days. On several occasions lately he had stayed at home if he had a "weak spell" after breakfast. However, he would do this on week days because he made more money on Sundays.

CASE III: M. M. Age 53. Chief complaint, "shortness of breath."

This man stated that he had been having attacks of breathing difficulty lately, but during the past three days the dyspnea had been continuous. He exhibited a sighing type of respiration, not related to exertion. He was extremely nervous and was afraid something was wrong with his lungs.

This patient until one year ago was an automobile salesman. Ten years ago he had a small business of his own and following financial reverses had had a "nervous breakdown." After this he sold automobiles until he went to work in a war plant one year ago. He was on a six-day week but changed shifts each month. He could not get adjusted to working at night and had difficulty sleeping during the day. Sometimes if he had not slept, he would stay home from work and lately had been missing work frequently. The only thing that seemed to help his breathing was whiskey. Due to this he had been accused by his foreman of missing work because of intoxication.

IT IS TRUE that there is nothing new about this symptom complex. Yet it is a factor to be reckoned with when remedial measures are sought in connection with the problem of industrial time loss from absenteeism. Without doubt many workers do not recognize this fatigue syndrome and there must be many cases where the symptoms impair the efficiency of the individual but are not sufficiently pronounced to cause him to seek medical advice.

Treatment must be individualized, but more rest and recreation is an essential factor. A thorough examination of the patient is necessary for convincing and adequate reassurance in order to allay anxiety neuroses.

Venereal Disease in Industry

C. F. YEAGER, M.D.,
Medical Supervisor, Remington Arms Company, Inc., Bridgeport, Connecticut

WAR was declared on venereal disease in 1936 by Surgeon General Thomas Parran. His famous magazine article in the *Reader's Digest* gave the American public for the first time unvarnished facts on this condition about which they had known very little. To most people "syphilis" and "gonorrhea" were horrifying and unmentionable words, and the public considered these diseases the result of some unlawful or immoral act. Immediately following the publication of this article, the public demanded action, and the newspapers, physicians, radio and motion picture companies, insurance companies, and health authorities cooperated in trying to educate the public on this subject.

Industry has a definite relationship to public or community health problems in all their aspects. In an organized public health movement three institutions are involved, each having a definite relationship to the other: namely, the home, the school, and industry.

From *Connecticut State M. J.*, April, 1943.

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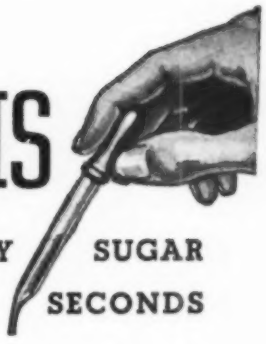

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Assuming that one out of every four persons in this country is working in industry and responsible not only for his own well being but also for the health of three others in his family, it appears then that industry is not only related to but has a definite responsibility in all matters pertaining to public health. The prevention of venereal disease is the most important health problem facing the community today. It is estimated that 3,200,000 persons in the United States have syphilis at this time and that the annual cost for the care of the syphilitic blind and insane alone is more than $41,000,000. A total of 338,746 soldiers were infected with venereal disease in the first World War, losing a total of 7,000,000 days of service. Of the first, 1,000,000 men examined for Selective Service over 60,000 were rejected because of venereal disease. Past records show very clearly that the incidence of these diseases increases during wartime.

Industry realized the importance of examining employees for syphilis as far back as 1920. This work was then done principally by railroad and public utility companies in order to decrease accidents. Since 1934 the Remington Arms Company has been doing complete physical examinations on all employees. The examinations include chest x-rays for the detection of tuberculosis or other lung diseases, and a blood test for the detection of syphilis. In conformance with the Connecticut state laws, applicants for employment in a communicable or contagious stage of syphilis are not given employment. All pre-employment blood tests are done in our own company laboratory. Unless an applicant admits that he has syphilis at the time of his physical examination, all positive blood tests are checked in either the local or state health department laboratories. All cases are referred to their own family or private physicians. Applicants who are financially unable to pay for treatments are referred to the local welfare or health department where they may receive free treatment. In all cases the employee's disease is kept strictly confidential by the plant doctor, the employee, and his own physician. Applicants or employees in a communicable stage are advised that they will be reconsidered for employment after they have been rendered non-infectious by treatment, and they are advised of the precautions to take. At the same time it is suggested to them that other members of their families should have blood tests in order to protect them. This is a very important thing to emphasize even though it is embarrassing on occasions. I recall several years ago that a married man applied for a position, and it was discovered that he had syphilis in a non-infectious stage and was given employment. In reviewing his history, it was found that he had contracted the disease about a year before his marriage but that he had received inadequate treatment. He was advised at the time of his physical examination that he should have blood tests done on the other members of his family. This, however, he failed to have done for which he was later very sorry when a member of his immediate family applied for a marriage license in this state. The premarital blood test required by law revealed that the applicant had syphilis.

New employees in the non-infectious or non-communicable stage are acceptable for employment provided they take proper and adequate treatment. One of the plant physicians is designated to keep an accurate check of the type and frequency of the treatments, as well as of the progress of the case, and private or family physicians are requested to advise the plant physician if the employee fails to cooperate with the prescribed treatment.

The Selective Service statistics for the state of Connecticut show that 1.3% of those examined had syphilis. This percentage is among the lowest of any state. The percentage of employees with syphilis at Remington's Bridgeport Works is less than the

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Selective Service percentage. This is possible because of the rejections of applicants in the infectious stages and also the curing of many cases discovered by blood test at the time of their employment.

At this point it must be mentioned that in most cases a diagnosis of syphilis can be made only by a blood test. A physician can only diagnose a very small percentage of cases without this test. There are still those who erroneously believe that you would most certainly know if you had syphilis or that a physician could detect the disease by other methods. The American Social Hygiene Society has presented some interesting data relative to cases found by routine blood tests for syphilis only when this condition was suspected; 0.6 cases were found in every 1,000 people examined. Contrasted with these statistics, when blood tests were done routinely on all those examined, 44 cases were found in 1,000. Furthermore, one of the big hospitals in this country reported that over 60% of the patients who come there with syphilitic heart disease had no previous knowledge that they ever had syphilis. This shows conclusively the value of blood tests for the purpose of diagnosis.

The diagnosis, prevention, and control of gonorrhea are more difficult than syphilis. Medical science has not, as yet, a simple and accurate procedure for the diagnosis of gonorrhea such as the taking of a blood specimen to diagnose syphilis. In addition, it is difficult to keep accurate statistics on the incidence of gonorrhea not only in industry, but in civilian life generally. Many people afflicted with this disease have in the past tried to treat the condition themselves by one means or another. These cases, of course, would not come under medical supervision and, consequently, there would be no record of them. Many of these cases are not only never cured but are permanently disabled. This is a bad situation, and there is much to be done today to educate the public to seek proper and immediate medical treatment for gonorrhea. It is believed, however, that the number of people with gonorrhea is much smaller than the number of those cases with syphilis even though gonorrhea probably attacks three times as many people in a year as does syphilis. This is explained by the fact that gonorrhea is usually of shorter duration by comparison.

A physical examination program in all industry, including a blood test for syphilis, would cover approximately half the population of the United States. It is estimated that the mechanical, metal trades and people employed in mining constitute 15,000,000, so that if this group were all examined and given blood tests, including members of the families of cases showing positive Wassermanns, half the battle would be won.

In industries where a venereal disease program is carried out the employees are most grateful to the company for making it possible to diagnose the condition, particularly those employees who had no previous knowledge of their affliction or thought that they were cured. Today, more than ever, preventive medicine and public health are recognized as vital to victory. Some of the agencies interested in the prevention and control of this public health menace are the American Medical Association, the American College of Surgeons, the United States Public Health Service, the American Social Hygiene Society, the Federal Security Agency, and the Surgeon General. The Surgeon General of the United States Public Health Service recommends the following program for the control of syphilis in industry:

1. Routine blood tests should be made on all employees at times of re-examination.

2. Routine blood tests should be made on all applicants for employment.

3. Patients with syphilis, if non-infectious, should be kept in employment and also accepted for work provided they agree to take the necessary treatment for syphilis. Those refusing treatment must be referred to the local health departments.

4. All persons with syphilis found by blood testing should be referred to the family physician for confirmation of the diagnosis and for treatment of the disease. If the worker is unable to pay for this service, he should be referred to clinics where diagnosis and treatment are available.

5. Strict confidence must be maintained between the plant physician and the worker regarding his condition.

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6. Cases should be followed up by the plant physician and his staff to assure that the patient continues treatment and that adequate treatment is being received. If facilities are available, health departments may assist in the follow up of cases.

7. An educational program should be developed which will teach the employees the facts about venereal diseases, how they are contracted, how they are spread and how they may be cured. The educational program should include information concerning prophylaxis.

Several years ago the Manufacturers Association of the State of Connecticut formed a joint Committee with the Industrial Health Section of the Connecticut State Medical Society to survey industry in this state to determine the extent of medical service. From this information it was possible to develop and offer a plan for medical services to both small and large industries, including facilities, personnel, equipment, and scope of work. This Committee is still active and ready to assist all plants in their industrial health problems. The Committee is greatly indebted to Dr. Clifford Kuh, formerly Chairman of the Committee on Industrial Health, and to Dr. Albert S. Gray, Director, Bureau of Occupational Diseases, State Department of Health, for their untiring efforts in formulating the plan. The most important task that this Committee has today is to interest small plants in the value of establishing a medical service in accordance with its recommendations.

Community and public health starts with the healthy development of an infant and continues through school and college ages. We now realize that the health of an industrial worker forms an integral and inseparable part of the health of the community. Today venereal disease presents the most serious menace to public and community health—a menace which can be crushed by the cooperation of industry, federal, local, and private agencies.

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The Cray Valley Industrial Association

CONSIDERABLE interest has been aroused by the recently introduced group scheme which is now operating satisfactorily in this small industrial area, and we give a general outline of the scheme in the hope that it will be of interest to those similarly placed.

The factory area here is on the edge of the Green Belt some 12 miles from London and is perhaps an ideal situation for an experiment of this nature. The factories are somewhat mixed both as regards size and employment roll and the type of industry carried on. The smallest employs no more than 12, and the largest rather more than 2000. The aggregate payroll of all members is, in round figures, 5000, with the result that we hope to be able to provide welfare amenities which will compare favourably with the factory employing a similar number of people. The range of industry includes paper mills, engineering shops, public works contractors, tool makers and even a newly-established diamond cutting factory.

This will give a very brief outline of the diversity of interests with which we have to contend, and it might be assumed we have very little in common. In point of fact, this is not the case, as we very soon found out when we convened an informal meeting of employers to consider the proposals. The meeting happily coincided with a period when management was being made more conscious of the coming industrial "new order" which is intended to give labour a new status and dignity and a closer kinship with management. Many of these proposals, whilst presenting few difficulties to the larger employers which cannot be solved by common sense and goodwill, are often impossible of achievement in the case of the smaller employer. It is, for instance, economically impossible to provide adequate recreational or medical welfare facilities in factories employing twenty or thirty workpeople which will compare favourably with those of the larger firms. In the past, Union rates of pay provided a more or less universal standard by which a worker could assess his remuneration, but it is likely that in the future the worker will take into consideration a variety of extra amenities which cannot be assessed in terms of pounds, shillings and pence. Obviously, therefore, the smaller employer who can offer nothing but a standardized rate of pay and the ordinary amenities covered by the Factory Acts will compete, at great disadvantage, with the larger employers. These, then, were the arguments which provided the basic groundwork for a cooperative scheme and which encouraged the employers to agree to test its possibilities.

The Association was then registered as a Company limited by guarantee and not having a share capital. The expenses of all business transacted by the Association are charged to members on a per capita basis so that the cost per employee to small members is exactly the same as to the larger firms. Nine Councilmen elected by the members are responsible for the business of the Association and have the power to appoint sub-committees for special purposes, and to co-opt to those sub-committees representatives of the workpeople whenever this is considered expedient or useful. The Council, in fact, aets as a general purposes or management committee and advises its members by bulletin or letter of the result of all business passing through its hands. It has discussed and taken action in such matters as the rearrangement of local passenger transport, and the pooling of canteen resources for night and day workers. It has distributed information on a variety of subjects such as fire-watching, Civil Defense, pension schemes, bonus schemes, joint works councils, holidays at home, war savings and salvage.

Perhaps one of the most useful and interesting committees is that appointed to deal with welfare. Its scope is so wide that it has been found desirable to divide it into two sub-committees, one to deal with medical welfare and the other with social and recreational welfare.

Dealing first with medical welfare, it appeared to be desirable to create a central clinic which would fill the gap between the factory first aid post and the panel doctor or hospital. Considerable man-hours and pay are lost in a large number of industrial cases because appropriate medical attention is not available either in, or within easy reach of, the factories. Cuts, burns and wounds which require regular dressings are often left dangerously neglected because of the time involved in attending hospital or the local panel doctor. The main work of the clinic is intended, however, to be of a preventive rather than curative character, and it might be of interest to show how we dealt with the problems presented.

In the first place it was decided to seek the closest cooperation with as many panel doctors in the immediate area as possible. They were all circularized with a brief resumé of the project and invited to attend a meeting for discussion. It was difficult at first to convince them that our scheme did not overlap with their duties or those of the hospitals and they were quite naturally against any proposals which thrust further work on their already overburdened shoulders which could show no immediate advantage. Our idea was to allow workpeople to go to their panel doctor in the first instance in the ordinary way, and from then on in suitable cases to pass to the clinic with written instructions so that the clinic could continue the treatment prescribed by the worker's own panel doctor. The local doctors subsequently agreed that the scheme should lead to considerable saving of time and further agreed to leave all the preliminary arrangements in the hands of two of their number, one of them being a lady doctor whose advice will be invaluable in the cases of the large numbers of female workers in the area.

The finding of suitable premises presented no little difficulty, but it was eventually decided to convert a rather badly bomb-damaged building in the centre of the group which would be readily available to all members. The premises consist of a waiting-room and enquiry office, the doctors' consulting and treatment room, and a small secondary treatment room and dispensary. On the first floor we have managed to provide a rest-room which is intended for the temporary cases, particularly amongst women, which can be returned to work after a short rest period. A further large bathroom on the first floor has been divided into cubicles for infra-red and ultra-violet lamp treatment, the bath being retained for scabies cases and the like. The clinic is in the complete charge of a state registered nurse who is also a registered mid-wife and health teacher with very considerable industrial experience. She has an assistant whose duties will be mainly clerical, but who will be capable of relieving the nurse during exceptionally busy periods. It is intended to keep very complete records of every case and to prepare a suitable analysis for submission to all subscribing members each month. As a purely temporary measure, and until experience can be gained as to the attendances necessary by the doctors, the rota of duties has been arranged so that they will attend at the clinic on one hour per day for two days of the week. This can be increased as circumstances permit or require.

The question of cost will doubtless be of some interest. Preliminary enquiries revealed that certain of our members already had adequate medical facilities and properly staffed clinics within their own works, and they could hardly be expected to subscribe to the central clinic. Finally 10 members expressed their anxiety to participate, involving an aggregate of 1250 workpeople. Our forward estimates of capital and running expenses were necessarily a little hazy, but the Sub-Committee finally submitted a scheme which called for payment from participating members of 12/-per employee for the first year. This was to be devoted entirely to running expenses, *i.e.* the nurse's and assistant's salaries, dressings, medicines, laundry, rent, etc. The capital expenses, which are presumed to be non-recurring, called for a further payment of 12/-per employee. The total sum subscribed under this heading secured a payment of £300 to the builders for rebuilding and decora-

From *Labour Management*, London, April-May, 1943.

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tions, and the balance for furnishing and equipment.

The next problem was to introduce the workers to the clinic in a way which would make them thoroughly conscious of this new service. We felt that the best means of achieving this would be to enlist the cooperation of the charge-hands, foremen and departmental managers, who would be primarily responsible for issuing, or recommending the issue, of pass-cards to workers to enable them to obtain advice or treatment. They attended a meeting at which they were addressed by the two representative doctors and the nurse-in-charge, and were afterwards invited to ask any questions they liked concerning the clinic and its proposed work. The scheme was received very satisfactorily and, in fact, impressed the employees of one of the member-firms so well that they have already volunteered to subscribe for equipment in addition to that already provided at the clinic. A few days after the meeting, leaflets were distributed to all workpeople through the medium of their pay-packets, explaining the scheme in the following terms:

"The Cray Valley Industrial Association Ltd. is an organization consisting of the managements of most of the factories in this area.

"The object of the Association is to find ways and means of improving in every possible way the working conditions of their members' employees.

"First consideration has been given to health, and the Association is glad to announce the opening of a medical clinic at 65, High Street, St. Mary Cray (Tel.: Orpington 309). With this new medical service managements hope to give employees the opportunity to maintain the standard of health which is so vitally necessary to meet the stress and strain of modern life.

"The service is ENTIRELY FREE. The very finest contribution YOU can make to the clinic is to use it. Charge-hands, foremen and other departmental supervisors will be issued with cards of introduction—they should encourage their workpeople to report all ailments to the clinic. It is only in this way that preventable illness CAN be prevented—and not merely cured.

"The full-time services of Nurse M. Chatterton, a fully trained and state registered nurse, are available. She is also a certified midwife and health teacher, and the managements have the greatest confidence in her ability to advise and assist in all health matters brought to her notice.

"The part-time services of nine doctors are also available on certain days of the week. Appointments can be made on application to the clinic.

"If you are already being treated by a panel doctor, tell him about the clinic. On his written instructions many treatments prescribed by him can be administered at the clinic—thereby avoiding loss of time AND pay.

"ALL information given by employees to the clinic staff will be treated in STRICTEST CONFIDENCE. The Medical Department is instructed that information given by patients must NEVER be divulged without their consent.

"Until further notice the clinic will be open from Mondays to Friday, 9 A.M. until 5 P.M. Saturdays, 9 A.M. until mid-day."

On the first day of opening, the clinic dealt with no more than one dozen patients, but it is certain that even some of these would have been neglected had the facilities not been available. It is hoped shortly to add such ancillary services as optical, dental and chiropody.

WANTED

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*Himes, *Medical History of Contraception*

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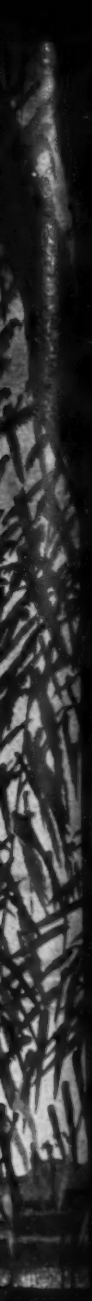

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